# THE JOURNAL OF GAS LIGHTING
## WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIV. No. 1633.] LONDON, AUGUST 28, 1894. [46TH YEAR. PRICE 6d.



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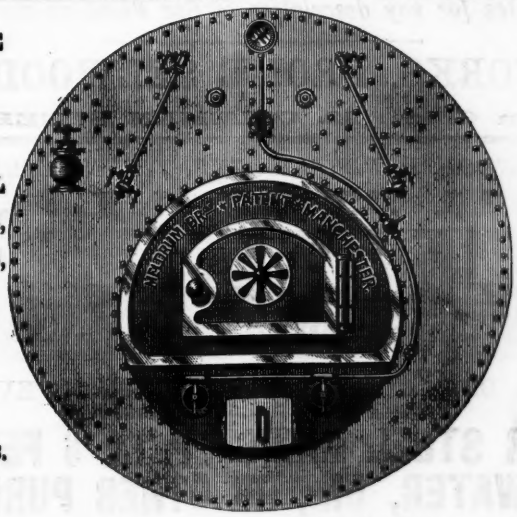


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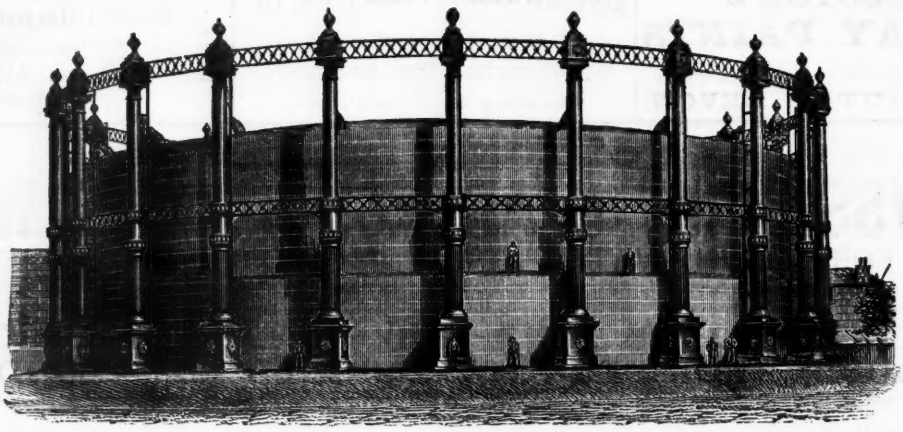

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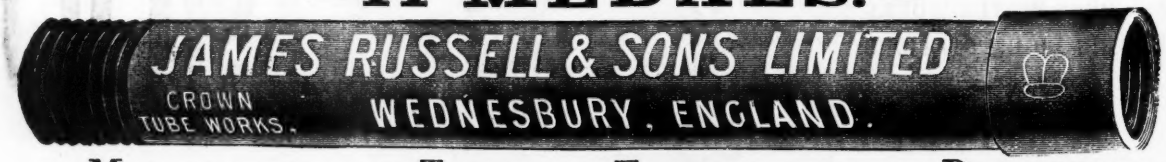


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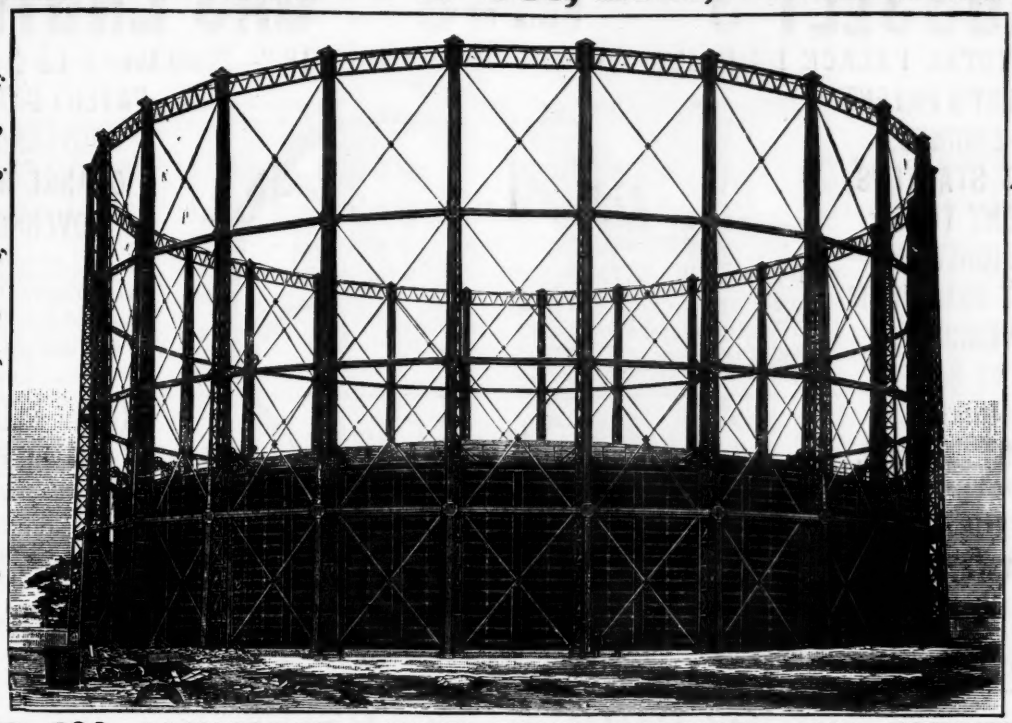

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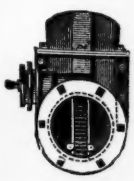

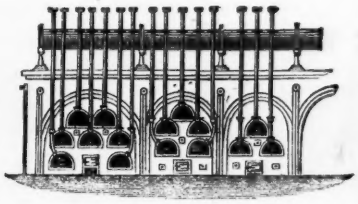

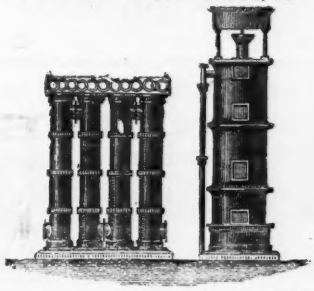

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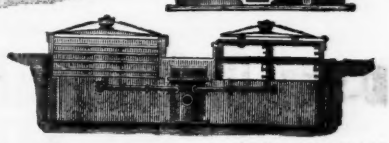

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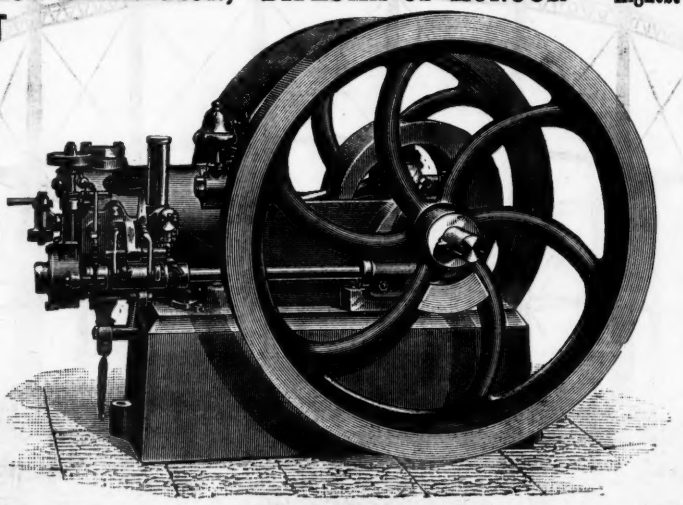

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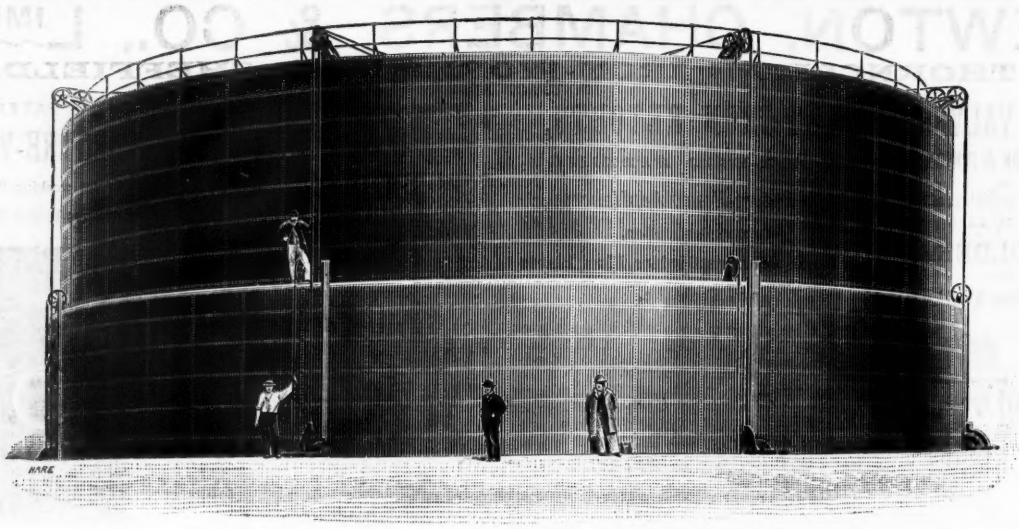

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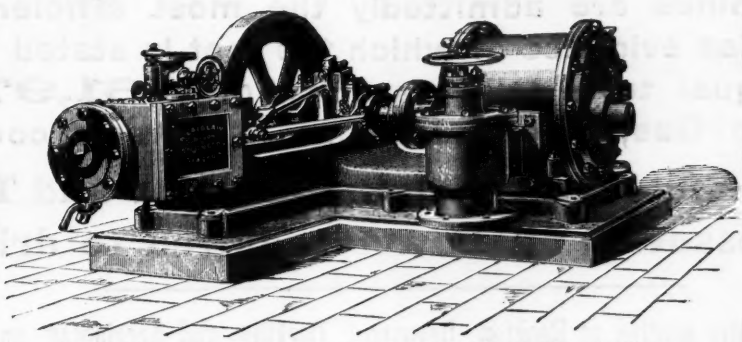

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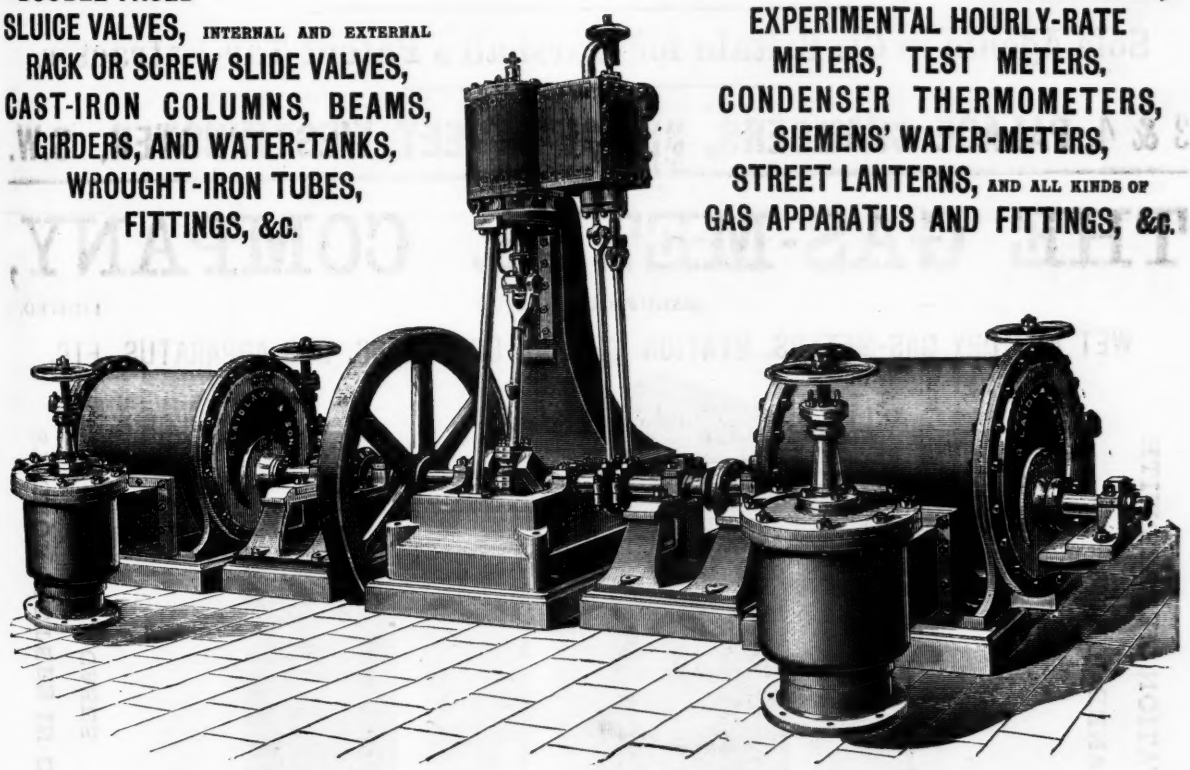

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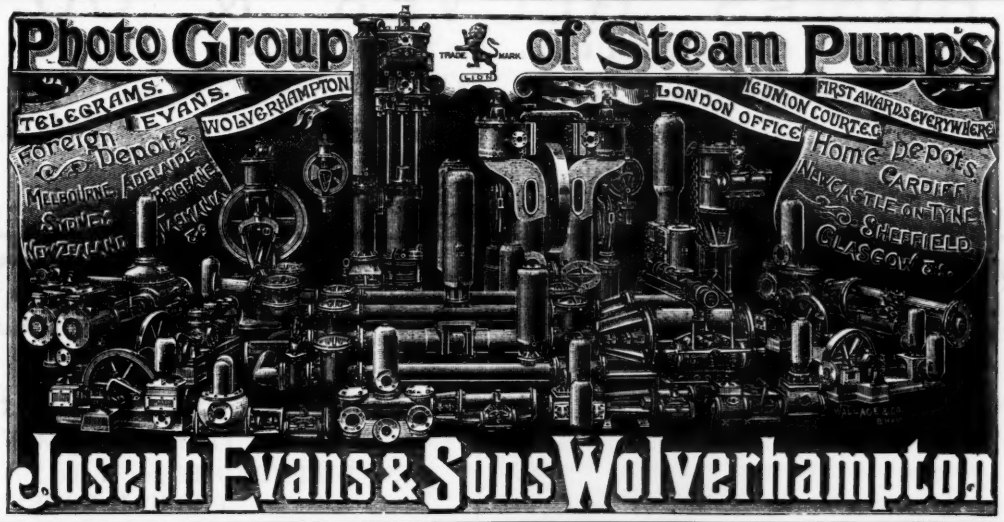


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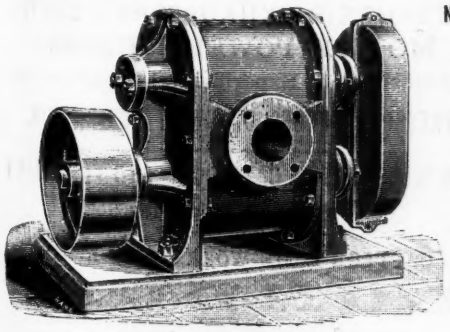

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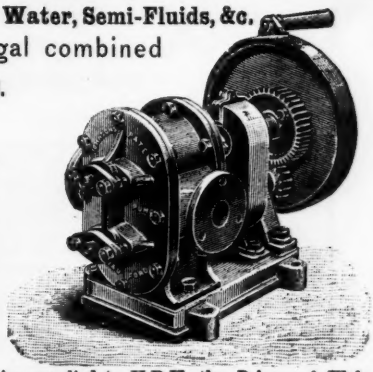

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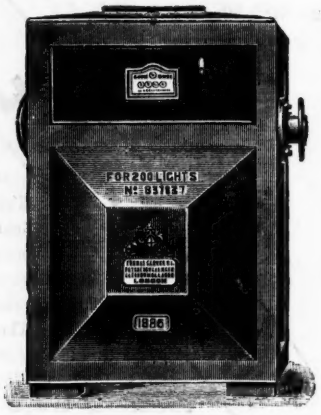


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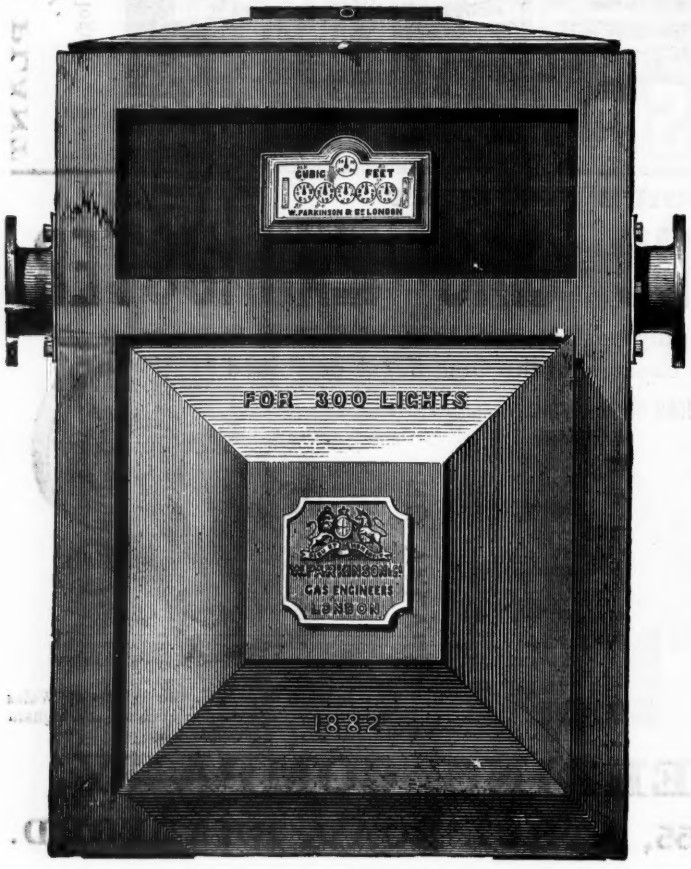


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### TO CORRESPONDENTS.

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THE

# JOURNAL OF GAS LIGHTING,

## WATER SUPPLY, & SANITARY IMPROVEMENT.

*TUESDAY, AUGUST 28, 1894.*


### French and English Street Lighting Practice.

In the course of the appreciative notice which we give in another column of the work of M. Henri Maréchal descriptive of the lighting of Paris, mention will be found of the care bestowed by the authorities upon the lamp-posts and lanterns used in the public lighting service of the French capital. We desire to draw further attention to this subject here, because the condition of the public lighting plant in very many English towns—London included—is anything but creditable to those who are responsible for it; and it does not seem unreasonable to hope that the example of Paris may shame some of our own people into better practices in this regard. Of course, M. Maréchal, like a true Frenchman, worships Paris and all that is in it. We need not follow him thus far, however, in order to see that one reason why Paris is what she is among cities lies in the solicitude of all concerned in the government of the town to do their duty worthily by it according to their best insight. Thus, in the matter of lighting, as in everything else, nothing is found too good for Paris. With ourselves too often the opposite policy is followed; and the "good enough" is the ideal of municipal managers. The gas lighting of London has long been a byword; that of Edinburgh is worse; and as for Dublin—— We are glad to be able to acknowledge that in some towns, such as Birmingham and Belfast, where the control of the gas-works has passed into the hands of the Municipality, an effort has been made to improve the street lighting; but, as a rule, the main purpose of British street lighting authorities has been, and still continues to be, that of cutting down to the lowest and most miserly limit the expenditure upon this service, when it is performed by gas. Hence our lamp-columns are hideous eyesores, the lanterns are often dirty, the lights are too far apart, and the burners are too small; and then the local wiseacres at once complain of the bad quality of the gas, and point to Paris as an example of good street lighting! Well, everybody who is interested in this subject has now an opportunity of learning from M. Maréchal exactly how they do these things in Paris; and if our Cook's touring municipal magnates have lain under the delusion that the Parisian effect is produced cheaply, or with no particular pains on the part of the authorities, they can undeceive themselves. We are told—what experts already knew—that the public lighting of Paris is not only a costly, but an exceedingly well-studied business. The best available taste, and the most highly-trained science presides over it; and no expense is spared to enable the pretty city to show herself off well by night.

There is electric lighting in Paris, of course; but, unlike the Commissioners of Sewers of the City of London, the Paris Municipality have not starved the gas lighting in the expectation of getting rid of it in favour of something else. "Paris cannot light itself after the style of a market "town!" And so wherever the gas-lamps go they are made to suit their surroundings. Why cannot we do likewise? There is no necessity to copy the French style in this respect. Some of their most ambitious efforts to glorify the architectural side of street lighting appliances do not appeal to strangers' tastes; but the principle is of universal validity. There is not much sense in trying to make gas-lamp columns a striking ornament to a street or public place otherwise destitute of charm to the eye. The canon of appropriateness will be satisfied if only care is taken to keep this portion of the furniture of our streets and public places up to the mark of the surroundings. Yet so far is this elementary point of street management ignored by our local authorities, that, in London and everywhere else, we find street frontages spoilt by mean, dirty, ill-proportioned public lamp-posts and lanterns, while there is perhaps a flaring high-power lamp of aggressive proportions at the next crossing.

What would our municipalities say to the coppering of lamp-columns at a cost of £4 10s. each, merely for the sake of the elegance of the effect produced by the treatment? This is done in Paris; and the copper coating is re-waxed and rubbed up every month. Paris will not have square lanterns, except for the outskirts. All the principal streets have circular lanterns, although these cost three-and-a-half times as much to maintain as those of square section. The glasses are cleaned every day, the posts are frequently washed, and all injuries immediately made good. Joint tours of inspection are made by the officials of the Administration and of the Company, to see that everything is right, and to avoid contests over the question of what are necessary repairs. Whatever it costs, in money and trouble, Paris must not be shabby. There is something very admirable in all this, although the expedient of coppering lamp-columns made of cast iron does not recommend itself to a purist in decoration—being a palpable falsification; but this is a detail.

A good deal might be done to improve the British lamp-post, if the administrators of our gas undertakings, working in harmony with the highway authorities, would take the task in hand. Many of the old columns ought to be broken up and replaced by better patterns, which could easily be done by setting aside a yearly appropriation for

the purpose. There are no sharper, cleaner castings than those turned out by our best English and Scotch founders, and there is no reason in the world why British towns should, in regard to their public lighting appointments, be one whit behind Continental places which, to begin with, pay twice as much for their gas. We shall be glad at all times to say a good word for, and draw attention to the endeavours of, those gas engineers who will address themselves to the removal of this unquestionable reproach from our towns.

### The Gas Supply of Liverpool and Sheffield.

THE circumstances of the Liverpool United Gaslight Company were very fully and fairly explained, for the benefit of the proprietors and the public, by the Chairman, Mr. E. Lawrence, at the annual meeting of the Company last Tuesday. Our report of the Chairman's speech, to be found in another column, shows how hard the undertaking was hit by the coal miners' strike. This part of Mr. Lawrence's story supplies additional evidence of the extent of the consequential injuries inflicted by these industrial disturbances upon businesses carried on for such a narrow margin of profit as the law allows to gas companies—a margin, moreover, that has practically to be preserved under all conditions. What must strike the Liverpool public as the most satisfactory feature of Mr. Lawrence's official statement is the announcement that, notwithstanding the failure of the profit balance on the working of the undertaking for the past year to fully meet the ordinary capital charges, it has been found possible to effect a material reduction in the price of gas. This is due to the lower cost of coal and cannel under the contracts made last year, and not then carried out; so that, as the Chairman pointed out, though the Company have had to draw £25,000 out of their reserve fund during the past two years in order to pay the ordinary dividends, they are determined to give the consumers the earliest possible relief promised by the improved prospects of the undertaking. There can be no doubt as to this being a prudent as well as a liberal line of policy in the circumstances, and it goes to show that there is nothing in the old system of maximum dividends to prevent the public being well served by a gas company when the directors are inspired by the spirit of enterprise. It would have been interesting if the Chairman had given an account of the Board's experience with the prepayment meter system, which is understood to be making great headway in the city; but he did say, in reply to a question, that the new works—meaning the water-gas plant—are getting on rapidly, and will probably be ready for use during the coming winter. A very similar account of improved working conditions, resulting in a reduction of price, is given with regard to the gas supply of Sheffield in the half-yearly report which we published last week. Here the revenue from residuals considerably more than covered the coal bill—not, of course, including carbonizing labour. Sheffield is usually one of the first towns to feel improvement in the gas residuals market; and the management is not of an order to neglect any opportunity for realizing the full benefit of commercial movements bearing upon the interest of the Company. It is gratifying to see these two important Gas Companies—the Liverpool and the Sheffield—holding their own, and continuing to justify their existence in a region generally given over to the municipalization of the gas industry.

### Gas Companies' Undivided Balances.

AT the half-yearly general meeting of the Crystal Palace District Gas Company last Friday, Mr. George Livesey, who on this occasion made his first public appearance as Chairman of the Company, had a good deal to say about the circumstances of the undertaking, as will be seen by our report of the proceedings in another column. In answering a question respecting the Company's reserve fund, Mr. Livesey took the opportunity, of which we are glad, of drawing special attention to the new departure initiated during the past session by Earl Morley, the Chairman of Committees in the House of Lords, in connection with the Plymouth and Stonehouse Gas Bill. Ever since the West Ham Act of 1889, it has been the parliamentary rule to limit the amount of the undivided balance carried forward from one account to another by Gas Companies working under the sliding-scale. In the Crystal Palace District Company's case, this sum is restricted to £20,000. which, after all, is not so narrow a margin as some Companies have to work with. The idea of the limitation was, of course, that of compelling directors to make reductions of price at the earliest possible moment. When the matter came this year before Lord Morley and his Counsel (Sir Joseph Warner), the question was reconsidered upon its merits, with the result, as mentioned in the JOURNAL for the 17th ult., that the limitation was decided to be a mistake; and it was accordingly struck out of both the Plymouth and the Harrow Bill. Hence it is to be concluded that no such restriction will be inserted in future Gas Bills. As a matter of fact, the limitation in question must be either mischievous or unworkable. An undivided balance may be the fruit of many years' small savings; and if it were restricted in amount to something corresponding to the equivalent of 1d. per 1000 cubic feet on a company's output, it would simply follow that the directors would be compelled to give away, in the form of a temporary reduction of price, something which it would do the undertaking more good to keep in reserve. On the other hand, if the margin is made comparatively large, as in the Crystal Palace District Company's case, where it represents about 3d. per 1000 cubic feet on the year's consumption, the limitation is a dead letter, because the Directors would naturally deal with the money before it attained any such figure. Thus the wisdom of Parliament corrects itself as it goes on—in cases of this kind, happily, without any particular harm being done.

### The Manchester Institution at Huddersfield.

THE members of the Manchester District Institution of Gas Engineers had a pleasant and instructive meeting at Huddersfield on Saturday, under the presidency of Mr. James Braddock, of Radcliffe. The party met at the gas-works, where the visitors were received by Mr. Alderman Stocks, the Chairman of the Corporation Gas Committee, and Mr. W. R. Herring, the Engineer and Manager, who read the useful paper that will be found elsewhere on the general features of the undertaking and the manufacturing arrangements. The paper is of distinct value as a description of the kind of work which more often falls to gas engineers than those theoretical designs of brand-new gas-works for the supply of towns which are sometimes supposed to exercise the intelligence of constructors. We are very pleased to have the opportunity of remarking upon the large amount and creditable quality of the work that Mr. Herring has done for Huddersfield since his appointment; and it is only doing justice to him to state that, while few young men called to occupy a responsible post in a municipal department can have been confronted with greater difficulties in all directions than those presented by the Huddersfield Gas-Works in 1891, none has, within our knowledge, succeeded better in converting these difficulties into openings for improvement. During the first twenty years of municipal ownership, the controlling principle of the administration was to justify the purchase of the undertaking by making it appear profitable to the ratepayers; and, in pursuance of this policy, the sum of £107,847 was taken out of the profits, and handed over in relief of the borough rate. We do not know what permanent good the borough received from this subsidy. However, the effect of having to provide it was very nearly disastrous to the gas undertaking; for the plant was left old-fashioned, starved, and in disrepair. The cost of gas making was consequently very heavy; while the quality of the service left much to be desired. How Mr. Herring dealt with the problems which met him upon his taking over the works, "from furnace ashpans to meter-outlets," as his paper has it, must be gathered from his own account. It is enough to say that his visitors on Saturday, especially such of them as have had to struggle through the same order of experiences, were not stinting in their expressions of congratulation both to Mr. Herring and his Chairman upon the general result. If we needed a particular example to "point the moral" of our observations a fortnight ago on the subject of the reason why certain members of the London County Council hanker after the Metropolitan gas undertakings, it would be supplied by the Huddersfield case. For some twenty years the Huddersfield Corporation set themselves to "eat their cake;" and they had to pull up only just short of the uncomfortable end of having no more cake to eat. After the reading of the paper, the Institution proceeded to inspect the works; and the rest of the day was devoted to a drive around and

among the old and new Corporation water-works, or which the weather was hardly so "summery" as could have been desired. This was the only drawback upon the pleasurable nature of the proceedings; but, as nobody was to blame, it was philosophically borne. Much credit is due to the Hon. Secretary (Mr. S. S. Mellor, of Northwich) for the completeness of his arrangements in all respects.

### The Notice of Accidents Act.

ONE of the legislative fruits of the session of Parliament that has just come to an end is the brief but, to the industrial world, important Act for providing for notice of, and inquiry into, accidents occurring in certain employments and industries, which was noticed and summarized in last week's JOURNAL. The new law is actually in force—having received the Royal Assent on the 20th ult.; and the Board of Trade have issued notices to the effect that the Department is prepared to act up to its provisions. These, as we have explained upon a former occasion, apply to the "construction, use, working, or repair of any railway, "tramroad, tramway, gas-works, canal, bridge, tunnel, "harbour, dock, port, pier, quay, or other work authorized "by any local or personal Act of Parliament," as well as to the "construction or repair, by means of scaffolding, of "any building which exceeds 30 feet in height, or use or "working of such building in which more than twenty "persons, not being domestic servants, are employed for "wages." If this schedule should turn out to be not sufficiently comprehensive, the Board of Trade have power to make a special order rectifying the omission. It is unnecessary to repeat here the information that we have already given respecting the steps to be taken by employers under the Act; and it only remains to lay the utmost possible stress upon the new, and by no means light, responsibility which it throws upon the managers of statutory undertakings, who should not only make themselves acquainted with its terms, but also take steps for ensuring that their foremen and workmen shall render assistance in carrying out the law by formally reporting accidents, and preparing themselves to give clear and reliable evidence relating to every occurrence of the kind that may come under their notice.

### The Drafting of Acts of Parliament.

THE vanity of human endeavour to make language the vehicle of thought and the expression of intention has often been illustrated, but never more strikingly than during the last few weeks in regard to the deliberate performances of the Legislatures of the United Kingdom and the United States. The United States Senate have passed a Bill which, in consequence of an error in punctuation, is interpreted by the Executive in a sense that, it is safe to say, could never have been intended. This remarkable incident goes far to justify the caution that leaves out punctuation from the prints of Private Bills and Acts in Parliament; although, curiously enough, the Government draftsmen have no such fears of the result of misplacing commas, so that public statutes are sprinkled with stops in the ordinary style of literature. Yet the official draftsmen have not a particular gift of clear expression upon which to plume themselves, as shown by the recent litigation respecting the terms upon which the local authorities can acquire tramways. The proprietors of statutory gas undertakings are in so safe a position themselves, that they can afford to pity the less fortunate holders of statutory tramway shares, who have all along been labouring under the delusion that, in denying all claims for past and future profits in the event of the municipalization of their property, Parliament intended them to be compensated for relinquishing profits actually earned. It is, of course, idle to kick against what the Lords say is the law of the land. But there is always the possibility of amending it; and this is the course which Mr. W. J. Carruthers Wain, the clever Chairman of the Deptford and Greenwich Tramways Company, has just been recommending to his proprietary. Recognizing that, under the law as lately defined, a local authority may buy tramway plant without giving anything for tramway profits, this expert says the logical conclusion would be to obtain an Act compelling local authorities to buy all tramways, whether earning profits or not, at their structural value. This is indeed a logical conclusion; but anybody who expects the British Parliament to act logically, is certain to be doomed to serious disappointment.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 438.)

AFFAIRS on the Stock Exchange have been very quiet during the week just closed; and movements have been slight and unimportant for the most part. At first there was some degree of irregularity in their course; and then the prevailing tendency became weaker—always excepting the choicest investment securities. But after a time a more cheerful disposition was observable; and the close was brighter than the opening. The whole volume of business transacted, however, was exceedingly restricted; and there was no really important incident. The demand for gilt-edged securities was well maintained; and everything which comes fairly within the scope of that description was as firm as ever, and some of them even more so. The condition of the Money Market continues to favour their advance; and there is no sign at present of anything ahead of us to change the aspect of affairs. All things considered—the slackness of the season and the general tendency—business in the Gas Market has been fully as brisk as could be expected. The rate of improvement in quotations, which have recently been advancing by "leaps and bounds," has now somewhat abated—indeed, it could not be expected to last for many consecutive weeks; but prices, on the whole, are very firm. In Gaslights, moderate business was done daily in the "A." The opening prices were the best of the week; and the quotation does not look like rising any higher at present. The secured issues were active; and transactions were marked at excellent figures in all, while the "H" 7 per cent. has advanced. In South Metropolitans, business was only moderate; but the rise did not stop, and "B" and "C" are higher. Commercials changed hands at rather good figures; quotations remaining unchanged. Not a single bargain was marked in any of the Suburban or Provincial Companies. In Continentals, Imperial was active and firm; but European receded. It must be remembered, however, that the price had been advanced in prospect of the bonus, which has now been paid. The Indian Companies improved in price; but Pará was fractionally lower. Business in Water was fairly active; and quotations in general were firm, while Chelsea and New River rose.

The daily operations were: Business in Gas was about the average on Monday. South Metropolitan "C" rose 2; but European fell ¼. The position on Tuesday was much the same; everything being firm all round. Bombay old advanced ¼. Wednesday was a little more slack; and quotations did not vary. Thursday also was somewhat less active; but quotations continued on the rise. Gaslight "H" and South Metropolitan "B" advanced 2 each; and Oriental and Bombay new, ¼ each. Pará fell ¼. Friday was brisk; transactions in Gaslight secured issues being specially numerous. Chelsea Water gained 2. Saturday was without any particular feature; and the only change was a rise of 2 in New River.

### ELECTRIC LIGHTING MEMORANDA.

**The Sanitary Aspect of Electric Lighting—Electric Lighting and House Cleaning—Methods of Charging for Electricity Supplied from Central Stations.**

THE supposed superiority of incandescent electric lamps to gas-burners in the matters of healthiness and cleanliness has always been a stock argument of partisans of the former, who have employed it to show that their system of lighting, although unquestionably dearer in itself, is cheaper than gas in the end. This argument was one that those who favour gas lighting were unable to answer, because it partook of the nature of prophecy, with which, of course, they had no means of dealing. So long, therefore, as electric lamps were a light of the future, it was pretty safe to claim for them all sorts of consequential advantages. The sanitary plea referred to one of these promised benefits; and it was roundly asserted that the necessity for ventilating crowded interiors would cease to give trouble when these were lighted solely by incandescent electric lamps, while the cost of the light for places of business would be recouped by the saving due to the better health of the clerks and warehousemen under its benign influence. Indeed, it has been claimed that the health statistics of St. Martin's-le-Grand showed a marked improvement even when the new system of lighting was confined to a single floor of this huge establishment. We have waited, hitherto in vain, for reliable data in support of this claim; and we still wait. It is only too true that there are places of business in London, and elsewhere, where men are required to work in an atmosphere in which neither gas-flames nor human beings should be permitted to exist; and it is quite possible that the adoption of incandescent electric lighting in such places may render them a little less penible for their occupants; but this is not much for sanitarians to rejoice over. And as to the superior cleanliness of the electric light, which was expected to result in a marked economy of expenditure upon interior decoration, it is rumoured that the experience of the west-end clubs and hotels in which incandescent lamps have been for any length of time installed does not bear out the promise, and that the decorators' trade has not suffered from the new fashion of lighting.

This is only what was to have been foreseen. The sources

of the dirt that accumulates so much more rapidly in town than in country houses are manifold; and the choice of different systems of lighting which individual householders in the dirty town have at command, cannot greatly affect the general result. Dust and smoke are the chief sources of this dirt; and the most conspicuous manifestation of its existence in the atmosphere—embrowned ceilings—is certain to show itself, however the apartments may be lighted. After a season's wear and tear, a club-house, hotel, or town residence that is much resorted to must be thoroughly cleaned, if it is to continue sweet and even passably healthy; and nobody concerned asks twice how it is lighted when these prime necessaries of comfortable occupancy are attended to. Where they are neglected, fustiness will at once assert itself, notwithstanding the presence of a light of non-combustion, which will show up dirt even if it is comparatively slow to precipitate it. On the whole, therefore, there is reason to believe that those town residents who adopted incandescent electric lighting with a view to saving something upon the "spring cleaning" account have been disappointed.

An interesting paper by Mr. A. H. Gibbings, the Electrical Engineer to the Hull Corporation, describing and discussing the various methods in use for charging the public for electricity supplied from a central station, has recently been published in the *Electrical Review*. This question has given a great deal of trouble to the supply companies; the difficulty arising, of course, from the fact that electricity is a costly commodity, no matter how it is charged for. This is admitted by Mr. Gibbings, who frankly states that "the amount of the quarterly bills is the *fons et origo* of all dissatisfaction." It is also recognized that "the consumer very rarely has even an approximate idea of the quantity of current which he is likely to consume, until after his first year's account has been made up." The result of this uncertainty is apt to be a cause of unpleasantness to both parties. It can be easily understood that the supply authorities would like to hit upon some method of charging which could be relied upon to satisfy both themselves and their customers; but the peculiar conditions of the industry render this *desideratum* difficult to formulate, much less establish. Mr. Gibbings has conceived a notion of what he calls an "ideal method," whereby, among other results, the charges per unit might be definitely fixed, and those consumers who require the light during the hours of maximum demand upon the station would be charged the top rate for this period, and a lower price at all other times. An automatic arrangement would be required to effect or to register this differentiation; and such an appliance Mr. Gibbings believes he has found ready to hand in an invention by Mr. Gisbert Kapp. It is not for us to pronounce judgment upon any of the multifarious devices by the aid of which electrical engineers hope to solve the puzzles of central station working; and we must therefore leave Mr. Gibbings and Mr. Kapp to the task they have set themselves. The former thinks that the electic light and motive power business would flourish better if it could be definitely stated beyond all doubt that the price for current would be some attractive low figure per unit during the day and night, and a paying margin more for two or three hours in the evening, as the case might be, in any particular town. This is as may be. The practice of offering day supplies of electricity at a cheap rate with the object of encouraging the use of motors, &c., is not unknown; but so far it has not been rewarded with conspicuous success. Mr. Gibbings proposes in effect to "put the boot upon the other leg," by posing the lower charge as the standard, and just hinting at the higher rate that the exigencies of the service require to be paid during the diurnal period of maximum load on the station. The idea is not without plausibility; but the question remains as to how it will strike the consumer when the bills are sent in. As the author of the scheme says, it is the high peaks in the central station load-curves that cost; and he adds that "no system can do more to eliminate these than to charge the higher price at the period of maximum demand upon the station." But this is not elimination; it is only compensation at the best, and at the worst it is the introduction of a system of differentiation which consumers may not appreciate. After all, an electric lighting station exists for the purpose of supplying light when needed; and it appears unjust to make too much of the "high peaks," which, after all, only represent the working of the natural law that people want to light up when it begins to get dark. It is not the fault of the public, but the misfortune of the electric lighting interest, that this condition of the business renders it difficult to carry it on upon reasonable terms. The public will fail to understand why electric lighting engineers should complain so bitterly of their diurnal trouble with their maximum load, whereas restaurant keepers, for example, are content to put up with the sudden incidence of luncheon and dinner hours. Of course, the lack of means for storing electricity against the time when it is most wanted, is at the bottom of the trouble. But this can be overcome by paying for it; and no engineering will avail to relieve the public of this part of the duty of consumers of electricity for lighting purposes. "You may scheme, you may double your meters at will; But the cost of the unit will cling to it still!"

**Electrical Standards.**—The Queen has approved of new denominations of standards for electrical measurement; and they are set forth in the *London Gazette* for Friday last.

## THE LIGHTING OF PARIS.

The idea that Paris is the best-lighted city in the universe, is one of the commonplaces of travel-talk, and occasionally falls to be mentioned in technical discussions such as that which has recently engaged the attention of British gas engineers in regard to the complex problem of the relation between the illuminating power and the lighting effects of gas. It is advisable, however, that, when specialists undertake to engage in controversy on a point of technics, they should be well posted in all matters that may be essential to the full comprehension of the question at issue; and therefore we were prepared to welcome, in the name of British gas engineering, the handsome and substantial volume* in which M. Maréchal has described, with all the curious fulness of French technical memoirs, the various methods of artificial lighting employed in Paris upon the public thoroughfares, in the promenades and gardens, in the public buildings, the railway stations, the principal shops, and in private houses. We desire to say at the outset, before descending into detail, that M. Maréchal's really splendid work is a unique production, revealing itself at a first glance as a worthy example of the results of that severe training in scientific method, which, grafted upon the native genius for felicitous expression, has made French civil engineering literature so peculiarly fascinating to technicians whose studies, whether for good or evil, have been differently ordered. It is a book that should find a place upon the shelves where gas engineers of whatever nation keep their most indispensable books of reference. We desire also to acknowledge the generally excellent style in which the book is printed and illustrated.

It would naturally strike one as remarkable that even a French engineer could find, in the artificial lighting of Paris, material for filling a large octavo volume of nearly 500 pages. But when the scheme and scope of the work are perceived, it becomes evident that, if the writer had not tempered his zeal with mercy, he might easily have increased his volume indefinitely. Everything in and about Paris arouses the enthusiasm of a true son of France; and so it is not to be wondered at that an engineer who actually has to do with the supervision of one of the most important of the public services of his beloved Lutetia, empress of cities, should expand into the widest bounds of print in the endeavour to do full justice to his subject. And it is quite in accordance with the nature of things that M. Maréchal should introduce his book with the declaration, at which nobody is likely to demur, that "Paris is, on all accounts, a town unique in the world." And he goes on to say that what contributes above all to its brilliancy and gaiety is the intensity and harmonious variety which preside over the lighting of its great public thoroughfares; and to claim that while the art of lighting is no monopoly of any country or capital, it certainly has in Paris its fullest scope.

M. Maréchal devotes his first chapter to history; commencing with a glance at the way of life of the Parisian public in olden times, when the absence of systematic lighting compelled the people to divide their day very differently from the manner now observed. This is an order of considerations growing out of the study of lighting which has often attracted us, and led to the remark that the influence of systematic artificial lighting has been too little regarded by the majority of the students of sociology, who have compared the rapid progress of civilization during the present century with the stagnation of earlier times. M. Maréchal tells the tale of the discovery of gas pleasantly after the French manner, ascribing the credit of it to Philippe Lebon, on the somewhat vague score of his having begun his "first researches" in 1791. It is, however, admitted that, whereas Lebon operated upon wood sawdust, and took out his first patent in 1799, Murdoch made coal gas in 1792, and lighted Boulton and Watt's factory in 1798. There is no evidence to show that Lebon contemplated the production of a distributable gas; and he never did more than construct what he called *thermolampes* for heating as well as giving light on the spot. It was the "promoter" Winsor, who, after what the author delicately refers to as "the events of 1814," introduced true gas lighting into Paris, where it, of course, met with violent opposition, as it did everywhere else. The first two Parisian Gas Companies were obliged to liquidate. Then the Government intervened; and the experimental success of the new system of lighting was established by the public-spirited efforts of the Comte de Chabrol. Then fresh companies were formed; and the age of competition began, which ended in the establishment of the existing Company—unquestionably one of the foremost industrial concerns in France.

We must not, however, linger over these matters, but proceed to M. Maréchal's account of actualities. In his second chapter, he gives a *resumé* of gas manufacture as practised by the Paris Company; and this leads him to the statement, in a couple of lines, of the gist of the famous "gas question" that troubles the relations between the Company, the public, and the Municipality. It is that the price at which gas can be sold in any town is determined by commercial, rather than by manufacturing considerations—which those who have been responsible for

* "L'Eclairage à Paris: Etude technique des divers Modes d'Eclairage employés à Paris." Par Henri Maréchal. Paris: Baudry et Cie.; 1894.

regulating the dealings of the Company with the public have only just discovered. The distribution of gas is fully described by the author in an important chapter, which deals very minutely with the technical and also with the administrative aspects of this branch of the subject. It is an interesting indication of the degree to which French officialism extends, that nobody can establish in Paris, inside any habitation or building, "one or more appliances intended for lighting or heating by gas, nor make use of those already installed to notably enlarge or modify their form or dimensions, without first demanding and obtaining the authorization of the Prefect of the Seine." This permit is granted in the name of the signer of the demand-note, who is bound, in the event of his leaving the premises, to inform the Administration of the name of his successor. No gas appliance can be put to use without the written permission of the Prefect; but if it is only a matter of using appliances already installed and passed, the written receipt of the application will suffice for authority. In other cases, authority is not granted until the work has been passed by the municipal officials, in accordance with regulations which supply curious reading. What is more, the Administration can make, by its agents, inspections of internal gas-fittings whenever it pleases; and these officers are charged with the duty of satisfying themselves as to the good condition of every part of the apparatus, and the absence of leaks.

It is not until his fourth chapter that M. Maréchal arrives at the matter with which the hasty Briton would probably have commenced a book of the same character—the principles and practice of actual lighting by gas as this is done in Paris. We are, however, first instructed in the photometrical methods pursued in the capital, and are told that the legal testing is done at twelve stations between the hours of eight and eleven in the evening. Three tests are made at half-hour intervals; and the mean of these is taken as the true illuminating power of the gas. These daily averages are again reduced to monthly averages. It is interesting to note that M. Maréchal makes out the Paris gas to be of 15·2-candle power, on the basis of the London system of testing—that is, with the statutory Argand burner consuming 5 cubic feet per hour. With regard to the applications of this gas, the author observes, with a fine sense of the importance of the subject, that "Paris cannot light itself after the fashion of a country town; and there is no municipal service which should be assured with so much care and regularity. It is no small business to look after the thousands of appliances that burn every night upon the public ways. The choice of burners, of standards, the placing of the lighting centres—all give rise to veritable problems." Alas! what would M. Maréchal say if he were told in how hap-hazard a fashion all this kind of thing is usually done in this country? The lighting of Paris is the care of highly-educated gentlemen. Here it is done anyhow; and the first touting electrician who talks to highway authorities respecting his view of the matter, finds nobody to contradict him.

Our municipalities might take a lesson from Paris in regard to the selection and care of street lamp-posts and lanterns. M. Maréchal admits that the old model posts were "sufficiently uncomely." They have been banished to the outskirts of the town. The new model is held to be really satisfactory. It is of cast iron, bronzed either by the brush or by the Oudry process. As illustrated, these lamp-posts are of a form at once substantial and elegant. They are maintained by the Gas Company; "this maintenance consisting principally of the renewing of the paint, the washing of the posts at least once a month, and a monthly wax-polishing of those that are coppered." It is confessed that the coppering process is costly—112 frs. per post; but it is thought that the pillars gain by it an air of neatness and elegance which greatly contributes to their decorative effect. Certainly they do these things much better in France. An Oudry lamp-column complete costs in place about 270 frs. This is the ordinary pattern for good streets; but for special localities—such as bridges, squares, &c.—gorgeous erections are adopted which do not always strike the foreign observer as improvements upon the less pretentious patterns. It is curious that the recuperative and other special types of high-power gas burners to be seen in the streets of Paris are all of strictly local reputation; hardly one of them being in use upon its merits elsewhere. On the other hand, in private lighting, the French capital employs many lamps of generally well-known kinds, from the Welsbach downwards.

M. Maréchal devotes several chapters to the description of the electric lighting arrangements of Paris, into which matter it is no part of our present business to follow him. His concluding chapters deal with various minor systems of lighting, and with illuminations—which subject, by the way, is very imperfectly treated. One of his most valuable chapters sets out the science of public lighting, and gives all the necessary calculations for determining the effect of any kind of artificial light-source upon the surface of a street. He confesses that the distribution of light-sources over the surfaces of the Paris streets does not follow any fixed rule; being often governed by fancy. The first essential is, naturally, regularity of spacing and equality of height. But there still remains the consideration that there must be a most economical and effective disposition of the lamps required to give a certain result in lighting duty; and the author shows how this disposition may be arrived at from given data. He does not add anything materially fresh to the stock of knowledge of this subject; but he very instructively works out the surface lighting of various typical streets and centres of traffic. It is quite as instructive to observe that, like many others who have treated this subject mathematically, he is carried away by his own figures; and he despises the common street gas-lamp for its poor illuminating effect. It never occurs to him that roadway lamps serve a most valuable purpose, even though their light may not be bright enough to enable one to read a newspaper in the middle of the road. Into this small criticism we concentrate all the blame we can find with M. Maréchal's very interesting work. It is, on the whole, highly commendable.

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**Death of Mr. H. Faija.**—The death is announced, in his 50th year, of Mr. Henry Faija, M.Inst.C.E., whose name has been frequently mentioned in our columns in connection with the manufacture and testing of Portland cement, on which subject he was a recognized authority. He contributed papers thereon to various scientific bodies; two being to the proceedings of the Society of Engineers, of which he was one of the Vice-Presidents. Mr. Faija's connection with the Institution of Civil Engineers dated from 1875.

**Sanitary Inspectors' Association.**—The annual summer meeting of this Association (of which Sir B. W. Richardson is the President) was held at Ramsgate on the 17th inst.—Mr. H. Taylor in the chair. The members were received at the Royal Hotel by the Mayor (Alderman Blackburn). Mr. W. A. Valon, J.P., the Engineer to the Corporation, delivered an address on the gas and water supply, drainage, and sea-front improvements of the town. A paper upon the duties and responsibilities of sanitary inspectors, prepared by the Medical Officer of Health (Dr. Styan), was, in his absence, read by the Chairman of the Sanitary Committee, Alderman Emett; and Mr. E. Tidman dealt with the future work of the Association. At the close of the business, the members were invited to luncheon by the Mayor; and subsequently some of the visitors were conducted to the harbour works and improvements, which were explained by Mr. Valon.

**Removal of Carbon from Retorts.**—Messrs. Robert Good and Samuel Spencer have recently taken out a patent for effecting the removal of carbon from gas-retorts in a cheap and expeditious manner. However thick the deposit may be, a single or double retort can, we understand, be scurfed in from 15 to 30 minutes; and, as a matter of fact, in the case of the very first retort (single) operated upon by Mr. Spencer in removing carbon 2 inches thick, at the Carshalton Gas-Works, it was completely done in 12 minutes, and might have been carried out in a few minutes less. The scurfing operation is of the simplest kind, and only requires a flexible tube to be attached to a water-pipe giving 10 or 20 feet head, and then connected to a tube, with a scurfing-tool at the end about 12 inches long, and perforated with half-a-dozen small holes. By pushing this into the retort gradually from front to back, the carbon (from the contraction set up by having cold water sprayed on to it), may be easily detached by simply having a sharpened pinching-bar, and "prising" the deposit off without using force. The advantages claimed for this process will at once strike all gas engineers; but it may be well to mention the serious difficulty experienced in some works in the winter, when every retort is required, in having to throw a bed out of use for scurfing, and losing perhaps three or four charges. This would be obviated by the process now introduced, and allow of the continuous use of all the retorts, with the slight delay already mentioned.

**Death of M. Georges De Vigne.**—The sudden death is announced, at the comparatively early age of 44, of M. Georges De Vigne, of the Imperial Continental Gas-Works at Lille; the immediate cause of his decease (which occurred after only three days' illness) being inflammation of the lungs. M. De Vigne entered the service of the Association in 1871, as Pupil Engineer at Lille; and in 1882, on the removal of Mr. J. F. Drory to Antwerp, he was appointed Engineer and Manager. Subsequently, when the Association acquired a large interest in the Wazemmes Gas Company—an important undertaking supplying gas from five works to the whole of the neighbouring districts of Lille—M. De Vigne also became Manager of that Company; and he held concurrently with these two appointments the position of President of the Lille Electric Company. Among his professional brethren, he was much esteemed; and his reputation and urbanity had secured for him the honour of being elected a member of the Committee of the Société Technique du Gaz en France. M. De Vigne was a man of conspicuous ability and of great judgment; and he will be greatly missed by the undertaking whose interests he so faithfully and ably served—indeed, the Secretary of the Association (Mr. R. S. Gardiner), speaking to a representative of the JOURNAL yesterday, said he was sure he would have the concurrence of his Directors in saying that the value of M. De Vigne's abilities and his worth to the Association could not be exaggerated. He was not only greatly esteemed by the Directors, but it might be said that he was loved by all his own staff and subordinates, to whom his sudden death comes as a great personal loss. According to the arrangements, his funeral, which took place yesterday, was to be made the occasion of an imposing demonstration of regard by all classes of the inhabitants, including the local authorities.

## NOTES.

### The Force Developed by "Water-Hammer."

All engineers are familiar with the phenomenon of "water-hammer," or the shock experienced by pipes containing fluids in motion, when this motion is suddenly stopped by the closing of a cock or other appliance for controlling the flow. Important as the matter is, however, an examination of the available literature indicates that very little experimental work has been done on the subject, and that an equally small amount of theoretical consideration has been given to it. Accordingly, Professor R. C. Carpenter has presented a paper to the American Society of Mechanical Engineers recounting some experiments performed under his supervision at Sibley College. The most important series of tests were undertaken with a 2-inch water-main, in which the "hammer" was produced by suddenly closing a gate-valve across the full section at various rates of flow. Tests were made with velocities varying from 3 feet to 9 feet per second—first, with no air chamber on the pipe at all; secondly, with an air chamber of 320 cubic inches capacity; thirdly, with an air chamber of 40 cubic inches capacity; lastly, with a water chamber of a capacity of 320 cubic inches. The readings of the pressure indicator were plotted out; and they afford fairly regular traces, showing the increase of pressure with the increase of velocity under all the conditions. It may be stated, as the general result of these tests, that the value of a water chamber in checking the shock due to suddenly closing the valve is *nil*. Without an air chamber, the "hammer" threw upon the pipe a pressure of 98 lbs. at a velocity of 2·92 feet per second; rising to 289 lbs. for a velocity of 8·60 feet. With the small air chamber, the pressure was 94 lbs. at a velocity of 3·92 feet per second; and 249 lbs., at a velocity of 8·26 feet. With the large air chamber, a velocity of 3·70 feet gave a pressure of 50 lbs.; rising to 120 lbs. for a flow of 8·45 feet per second. The results are of interest as showing the high pressure that may be produced in a main by stopping the flow of water, even when the velocity is small. It is also interesting to note the relative effects of the air chambers. Although the larger one was eight times the volume of the smaller, it only halved the pressures produced by the "hammer" effect.

### The Carbon Battery of the Future.

Dr. William Ostwald, Professor of Chemistry and Electro-Chemistry at the University of Leipzig, in a paper upon the problem of producing electricity direct from coal, observes that, by our newly-acquired knowledge of some constants, we can now predetermine, and very closely approximate, the electromotive force of any voltaic pile, howsoever composed; and also that a very thorough knowledge exists of the conductivity of electrolytes. He goes on to discuss the question of using coal as an element of a galvanic couple that shall produce electricity without resorting to burning the former; and he classes it as a problem of electro-chemistry. If we could produce a galvanic couple, constituted of coal and the oxygen of the air, which would be capable of furnishing electricity in amounts somewhat in proportion to the theoretical values, the result would be a technical revolution in comparison with which the one following the invention of the steam-engine would sink into insignificance. How such a galvanic couple might be constructed, cannot, of course, even be surmised at present. To one point, however, Dr. Ostwald definitely committed himself—that the active component must not be put into the vessel containing the substance on which it is to act. Thus, in a platinum-zinc couple, the sulphuric acid must be poured upon the platinum, which does not dissolve, instead of upon the zinc, which does. Similarly, in the Bunsen cell, the nitric acid is not poured upon the oxidizable constituent, but upon the carbon. This rule is of universal application; and it goes to show why Jablochkoff failed when, some years ago, he tried to produce electrical energy direct from coal by putting it into molten nitre from which the oxygen was to have been obtained. The resulting violent combustion actually generated current, but so little that it could not be utilized. Thereupon, Dr. Ostwald argues, the future coal element will have the oxidizing medium not on the side containing the coal; and this medium must either be the oxygen of the air itself or some other oxidizing substance producible in quantity from it. In its chemical aspect, such a couple would be like an ordinary stove, in which air acts upon coal, and carbonic acid is the resultant product, together with an amount of heat of which only a small fraction can be utilized. In the coal battery, the (as yet) undiscovered electrolyte would play the part of the stove—enabling the reaction to take place without itself being consumed.

### The Unreliability of the Electric Arc as a Standard of Light.

Mr. A. P. Trotter has been experimenting with the view of realizing as a practical standard of light, the method of screening off one square millimetre (or other definite area) of the crater of the positive carbon of an electric arc. He has found that the effective luminosity is not—as theory would predict—either constant or uniform. He has stated his results in a paper read before the Royal Society. By the use of a double Rumford photometer, giving alternating fields, as in a Vernon Harcourt photometer, Mr. Trotter's attention was called to a bright spot at or near the middle of the crater of the arc. The use of rotating sectors accidentally revealed that a periodic phenomenon accompanied the appearance of this bright spot; and although it is more marked with a short humming arc, the author believes it is always present. The period seems to correspond with the musical hum of the arc, which generally breaks into a hiss at a note a little beyond a periodicity of 450 per second. Extended observation showed that a bright patch, occupying about one-quarter of the crater, appeared to be rapidly revolving. Examination of the shape of this patch showed that it consisted of the bright patch already mentioned, and of a curved appendage which swept round, sometimes changing the direction of its rotation. The *à priori* theory of the constant temperature of the crater is so attractive that Mr. Trotter is inclined to attribute this phenomenon—not to any actual change of the luminosity of the crater, or to any wandering of the luminous area, as is seen with a long, unsteady arc, but to the refraction of the light by heated vapour. All experiments (such as enclosing the arc in a small chamber of transparent mica, or the use of magnets, or an air blast) have failed to produce any effect upon this phenomenon, which thus introduces an unexpected difficulty in the use of the electric arc as a standard of light, and one which may interfere with its employment in some circumstances as a steady and continuous source of light.

### A Water-Tank and Chimney Combination.

It is recorded in the *Génie Civil* that at the works of Messrs. Ferbeck and Co., of Aix-la-Chapelle, the novel departure has been made of storing water in an annular tank fixed round the top of the main chimney, at a height of 75 feet from the ground-level. From the outside, the erection has much the appearance of the spark catcher which is so distinct a feature of the wood-burning locomotive; and several advantageous points are claimed for the arrangement. The tank does not actually touch the chimney—being U-shaped in section, and so fixed upon a cradle as to leave a space for a current of air between the inner tank sheeting and the brickwork. This keeps the water from becoming sensibly heated in summer, while it does not freeze in winter. The whole thing is covered by an umbrella-shaped roof. The weight of the tank is 11 tons empty, and 122 tons when full. Although it is not mentioned in the account of this structure, the extra weighting of the chimney may actually tend to increase its stability, according to the results of modern experiments in this direction. Of course, the foundations of the chimney must be good; but, when this is the case, the expedient now described may be found useful in giving the command of a factory, by a water-tank elevated to a considerable height, at very small structural cost.

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**Friction Head in Water-Pipes.**—At a recent meeting of the Boston Society of Civil Engineers, a new formula for friction head in water-pipes was proposed by Mr. W. E. Foss. It is $I = C' Q^{1\frac{9}{10}}$, where I is the friction head in feet per foot, C' is a coefficient varying with the roughness and the diameter, and Q is the discharge in cubic feet per second. This formula has been deduced from that employed by Professor Unwin and M. Flamant, by determining, from a large number of experiments, the proper coefficients for use with both new cast-iron and riveted sheet-iron pipes. A paper describing the use of this formula, with a number of tables to facilitate its application, will be found in the *Journal* of the Association of Engineering Societies for June of the current year.

**Melting Out Lead Joints.**—A basket for melting out lead joints, formed of three pieces of old sheet iron, is mentioned in the *Engineering Record*. Two of the pieces, one for each end of the basket, are V-shaped, the inner semicircle fitting round the pipe so that the piece acts like a flange about 10 inches larger than the pipe. The third piece of iron is 18 inches long, and bent to fit the ends—a basket being formed in this way having the shape of the casing of a gate-valve. A number of inch holes are punched in the bottom for draught, and handles attached to the sides, through which an iron rod is passed over the main to hold the basket in place when in use. It was intended to employ hot coke in burning out the joints; but, owing to the small body of fuel, and its consequent rapid cooling, this was found unsatisfactory, and dry wood is used.

**The New United States Tariff.**—*The Times* of the 16th and 17th inst. contained the text of the clauses, in their final shape, of the Wilson Tariff Bill, which is to take effect as from the 1st inst. According to Schedule A (Chemicals, Oils, and Paints), carbonate of ammonia bears an *ad valorem* duty of 20 per cent., against 1¼ c. per pound under the M'Kinley tariff; muriate of ammonia, 10 per cent. *ad valorem*, against ¾ c. per pound; and sulphate of ammonia, 20 per cent. *ad valorem*, instead of ½ c. per pound. All coal tar colours or dyes, by whatever name known, and not specially provided for in the Act, are chargeable with 25 per cent. *ad valorem* duty, against 35 per cent. Under Schedule B (Earths, Earthenware, and Glassware), clays or earths, wrought or manufactured, not specially provided for, bear a duty of $2 per ton, as compared with $3; all undecorated articles composed of earthen or mineral substances, including lava tips for burners, 35 per cent. *ad valorem*, against 55 per cent.; and gas-retorts, 20 per cent. *ad valorem*, against $3 each. Under Schedule C (Metals and Manufactures of Iron and Steel), cast-iron pipe of every description is to bear a duty of 0·6 c. as compared with 0·9 c. per pound; while on castings of malleable iron not specially provided for in the Act, the duty is to be 0·9 c. instead of 1¼ c. per pound.

# TECHNICAL RECORD.

## A TEN-CANDLE LAMP FOR USE IN PHOTOMETRY.

**A Paper read by Mr. A. Vernon Harcourt, M.A., F.R.S., before the Physical Section of the British Association.**

The author has in former years brought before this Section a burner consuming a mixture of air with pentane vapour, and lamps consuming pentane vapour, which gave a constant amount of light equal to that of an average standard candle. When so small a light is used in the ordinary photometry of coal gas, errors from defects in the adjustment of the photometer, or from slight haziness in the atmosphere of the testing-place, are greater than when a light is used more nearly of the same magnitude as that of the gas-flame which is measured. A light of 10 candles is well suited for the purpose. It has been shown that such a light can be obtained from an Argand gas-burner consuming air saturated with the vapour of pentane; and a gas-burner has been proposed for use which is well adapted for this purpose, except perhaps in being of a rather complex structure. But to supply air saturated with pentane vapour at a steady pressure, there is needed a gasholder of a few cubic feet capacity. The addition of such a holder to the apparatus makes it more costly, and not easily portable. It has been shown that great variations may occur in the proportions of pentane and air consumed by the gas-burner without materially affecting the light given out by the lower part of the gas-flame. The admixture of air is, however, unnecessary, since at a moderate temperature pentane can be volatilized without there being any necessity for reducing the atmospheric pressure by the admixture of another gas.

The improved lamp [shown] is on the same principle as the one-candle lamp devised by the author seven years ago. The wick is raised or depressed by the ordinary rack-and-pinion movement; the lower end of it dipping into pentane in the body of the lamp, while the upper end is warmed by the heat conducted down from the flame. In the 10-candle burner, the wick fills the circular interspace between the central and outer tubes of the Argand. The only difference between this and an ordinary lamp is that the wick does not come near the flame, and needs no cutting or renewal; nor does the smoothness or roughness of its upper surface affect the burning. The dimensions of the lamp and chimney, upon which the air currents inside and outside the flame depend, have been determined by experiment, so as to produce a bright and steady flame. The entrance to the inner tube is through a triangular opening, as in the usual construction of such lamps. It was found that the free admission of air at this entrance caused an inequality in the flame —two peaks appearing on either side of the place for the admission of air. To steady and regulate the inflow of air at this point, a cylindrical case is fixed round the lower part of the tube, into which air is admitted through a circular hole 15 mm. in diameter.

The flame of a rich gas burning from a wide opening is of the colour of candle light, even when an abundant supply of air is provided on both sides of the flame. The light of a good gas-burner is less red or more blue than this; and it is important for the photometry of coal gas that the standard light employed should be as nearly as possible of the same colour as the light of the gas-flame. The light of the lamp has been brought to this colour by a small admission of air below the point of combustion. Twelve holes, each 3 mm. in diameter, have been drilled through the outer tube, 15 mm. below the top. The draught of the chimney is sufficient to determine an entry of air through these holes, which, happening under fixed conditions, is constant in amount. A short cylindrical screen goes round the chimney, the bottom of which is 60 mm. above the surface of the burner; and both screen and chimney are surrounded by a pentagonal shade, four panels of which are filled with blue glass, while the fifth, which is turned towards the disc of the photometer, is filled half-way down with a metal plate, which, overlapping the inner screen, allows only the light from the lower part of the flame to fall on the disc of the photometer. By supporting the lamp at such a height that the bottom of the screen is level with the centre of the disc, errors of parallax are avoided. Mr. Sugg, I believe, observed, and Mr. Dibdin has proved, that, with the flame of an Argand burner, the light thus given by the lower part is independent, within wide limits, of the total height of the flame. The observation is true not only for a particular burner, but for many, and probably for most, Argand burners.

Many alterations have been made in the structure of this lamp; and it has generally been found, though not always with equal exactness, that the height of the flame did not affect the light emitted from its lower part. As the lamp is now arranged, the height of the flame can be observed through the blue glass panels; and whether the top is just visible above the circular screen or rises to the top of the panel, the light which falls upon the disc of the photometer does not alter measurably. The adjustment of the light to the value of 10 candles—in other words, the adjustment of the height of the circular screen—has been effected by a number of comparisons between the lamp and the one-candle pentane standard.

## MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

**Quarterly Meeting at Huddersfield.**

The Ninety-ninth Quarterly Meeting of the above Institution was held at Huddersfield last Saturday—Mr. JAMES BRADDOCK, of Radcliffe, the President, in the chair.

By permission of the Gas Committee of the Huddersfield Corporation, the members (of whom there was a large attendance) met in the exhauster-house of the Huddersfield Gas-Works for the transaction of such business as there was on the *agenda*.

### A WORD OF WELCOME.

Alderman STOCKS, the Chairman of the Gas Committee, offered a few words of welcome to the members. He said that the gas-works, as they would observe in the course of their inspection, were at the present time in a transition state. They were, however, perfectly free to go through them, and see what was to be seen.

The business of the meeting was then proceeded with.

### THE DEATH OF MR. JOHN HUTCHINSON.

The HON. SECRETARY (Mr. S. S. Mellor) read a letter in the following terms from Mr. Walter W. Hutchinson:—

I beg to acknowledge your letter of the 29th of May, conveying the vote of condolence passed by the members of the Manchester District Institution of Gas Engineers upon the occasion of father's death, and desire that you will kindly inform the President, Vice-Presidents, Committee, and members how much the whole family appreciate the vote, as well as the feeling terms and sentiments expressed towards him, and sympathy with us in our great loss. We are all very much touched, and thank you.

### NEW MEMBERS.

Mr. E. G. Grimshaw, the Secretary and Manager of the Calverley and Horsforth District Gas Company, was nominated as a member by Mr. R. G. Shadbolt and Mr. John Wilkinson; Mr. William Newbigging, Consulting Gas Engineer, of No. 5, Norfolk Street, Manchester, was nominated by Mr. Thomas Newbigging and Mr. Isaac Carr; and Mr. G. W. Lupton, the Manager of the Otley (Yorks.) Gas-Works, was nominated by Mr. R. G. Shadbolt and Mr. Robert Porter.

On the motion of the PRESIDENT, seconded by Mr. J. NIVEN (Clayton), all three were unanimously elected.

### PAPER BY MR. HERRING.

Mr. W. R. HERRING then read the following paper, descriptive of

### THE HUDDERSFIELD CORPORATION GAS-WORKS.

In response to a particular request from our President, I have undertaken the task of preparing a paper on the above subject. But, at the outset, permit me to say it is drawn in quite an informal manner, and is intended to serve the purpose of introducing to your notice the chief features of these works, and the intentions of the reconstruction scheme now in course of execution, in order that the numerous parts may be properly understood, and to enable the members of this Institution to form a correct judgment as to whether the best scheme has been advised to accomplish the objects in view—with economy and efficiency.

The Huddersfield Gas-Works came into existence by the formation of a Company, with a capital of £3400, in the year 1821. The gas supply remained in the hands of the Company until 1871, when the works and mains were purchased by the Corporation for the sum of £140,400. At the time of transfer, the paid-up capital of the Company was £69,000; and the permanent expenditure £87,921. The weight of coal carbonized at this period (1871) was 20,467 tons. The capital, therefore, represented the very low figure of £3·37 per ton of coal carbonized, or, by basing the calculation upon the item termed "permanent expenditure," it stood at £4·29 per ton of coal. Evidently much more capital expenditure had been incurred than was recorded as such, or the works were in very bad condition at the time. The sum paid in 1871 was equal to £6·87 per ton of coal, which, on the surface, appears to be very moderate; but when the condition of the works at the time alluded to is taken into account, the matter stands on a different footing.

I have already scaled a period of fifty years of the history of the works—1821 to 1871. Another jump, therefore, of twenty years will not, I hope, be objected to. During the year 1891, 46,956 tons of coal were carbonized; and a capital of £289,910 employed, which was equal to a sum of £6·17 per ton of coal carbonized; the output from the works more than doubling itself in the period from 1871 to 1891.

When the Corporation took over the supply, there were 8200 consumers, and 90,000 inhabitants in the gas-supply area; there are now 18,000 consumers and 110,000 inhabitants. The district of supply covers a very large area, and extends beyond the borough. The borough has an area of 12,088 acres, with a population of 95,420; and outside this the gas-supply area covers 4637 acres, with a population of 14,580 inhabitants—making a total area of supply equal to 16,725 acres, with a population of 110,000, after allowing for the portion of the borough supplied by the Longwood Gas Company. The extreme limits

of supply from the works are 3 miles in an easterly direction, 4¾ miles in a westerly, 3 miles in a northerly, and 4 miles in a southerly direction. Taking a circuit of the boundary, as the crow flies, it measures 25 miles. There are at present laid about 105 miles of mains, from 2 inches up to 36 inches.

The district is very hilly. The works are situated at an elevation of 213 feet above the mean sea-level. The supply is directed downwards a total of 48 feet to a district 165 feet above sea-level; the highest points of supply being 600, 650, and 700 feet respectively. The maximum point of supply is 800 feet above sea-level; the highest point in the district to which we might have to go is 900 feet above sea-level.

During the first twenty years of municipal ownership, a sum of £107,847 has been handed over to the relief of the borough rates—a sum which you will all no doubt think should have been devoted to the depreciation of the capital, and consequently the cheapening of the cost of the production of the gas and its selling price to the consumer, instead of taxing the gas consumer for the benefit of the ratepayer.

During the winter of 1891 and 1892, the capacity of the works were strained to their utmost, in order to keep pace with the demand. We had some few spare retorts; but the remainder of the plant was totally inadequate to deal with the production forced through it. The consequence of this, both to ourselves and the public, I need not point out to you. When this matter was reported to the Gas Committee, I was instructed to thoroughly investigate and report upon the capacity and condition of the works, and advise what was necessary to be done in order to place the gas supply upon a sound and proper basis. At this period, the Leeds Road works consisted of three independent gas producing stations; Nos. 1 and 2 being existent at the transfer in 1871, and No. 3 erected in 1884.

The No. 1 section was capable of producing, at a maximum, 750,000 cubic feet a day, with condenser, and four purifiers, &c., capable of dealing with 500,000 cubic feet of gas a day. The No. 2 section was capable of producing 2,500,000 cubic feet per day, with condenser, purifiers, &c., equal to only 750,000 cubic feet. (This is giving an area of 0·4 of a superficial foot per 1000 cubic feet per day.) The No. 3 section was comparatively new; only one-half of the retort-house being fitted with plant, equal to 850,000 feet per day. The purifiers were equal to 1,500,000 feet; but without a condenser and sufficient scrubbing plant.

In framing my report, I first proceeded to investigate the conditions and possibilities of each section individually, making careful notes from furnace ashpans to meter-outlets. I then drew up sectional reports, with estimates of the cost of sectional reconstruction as far as circumstances would permit;* but with regard to the possibility of carrying out the extensions and improvements necessary to the plant by sections, there is a very serious obstacle in the way—namely, want of room. There are also other very important considerations to be taken into account before anything is determined with regard to the No. 1 and No. 2 sections of the works. It will be useless to spend money on improving one portion of the plant if the same modernizing principle cannot be carried throughout; and as the available space at our disposal is not sufficient to permit of the work being carried out as the circumstances demand, there is very little choice in the matter. But apart from this, the question remains: Is it in the interests of the public that the money necessary for the improvements and additions should be spent on the existing structures? For it must be borne in mind that the amount spent will simply put in proper order, or, more correctly, patch up, the existing sections, which have been in existence for some fifty years, and would not in the least degree increase the producing power of the works; and further, that the plant so added would be useless when the existing retort-houses required reconstructing at any future time, unless they were re-erected on exactly the same model, which, as already stated, will cost 80 per cent. per ton more than the new plan.

The question, therefore, as to the advisability or otherwise of patching up the two old sections of the works was very carefully considered by a Special Sub-Committee and the Chairman. They devoted considerable time to the question, with the result that they decided that it would not be wise to lay out any money on the existing structures, but rather to spend it on entirely new work, so as not only to put the present requirements right, but also to provide for probable future demands—in other words, to reconstruct the No. 1 and No. 2 sections by erecting new plant on the existing sites. With this object in view, I formulated a scheme of reconstruction and extension, which, when carried out in its entirety in a course of years, will make the works capable of producing 7½ million cubic feet per diem, or more than doubling the capabilities of the existing works, which amount, taking the ordinary 5 per cent. rate of increase, will be required in the year 1910.

The plans—one showing the works as now existing, and one with the proposed new scheme carried out in its entirety, on the total area of 12 acres—are before you here. Briefly stated, are as follows: On the site now occupied by the No. 2 section, it is proposed to erect a retort-house 300 feet long, which, when fitted with a double bench of inclined retorts, would produce 5 million cubic feet per day. At either end of this building, the coal-breaking and elevating machinery for 500 tons of coal per diem would be fixed; so that the supply could be obtained not only direct from the carts, but also from the projected storeage sheds—from the latter source by means of a tram-line under Gas-Works Street. The building-line of the retort-house on the canal side is set back a distance of 30 feet from the boundary wall on the towing-path; and on this space are the exhauster and boiler house, together with the workmen's mess-rooms. The building on the opposite side is the meter-room. The condensers are on a piece of ground at the canal side; thus offering facilities for the employment of water for part of the process. The loading of coke direct into boats could also be carried on from this side of the retort-house.

From the exhausters, the gas would be conveyed by means of square or rectangular tubes (also forming a bridge across the canal) to the present No. 1 section, which it is proposed to convert into a purifying station for dealing with 6 million cubic feet per diem. This site offers many facilities for such a purpose, as the canal can be utilized for the delivery of the materials (lime and oxide of iron) as well as for sending the spent materials away; and as it will be necessary to employ a greater proportion of lime in the purification than is the case at present, it will be necessary to provide an easy exit for the spent material.

The purifying plant is in two complete sections, each capable of purifying 3 million cubic feet per day. It includes washers and scrubbers for the ammonia purification, and a set of six purifiers for dealing with the carbonic acid, sulphuretted hydrogen, and bisulphide of carbon impurities.

From here the gas will be again conducted across the canal to the station meters and gasholders.

On land north of Gas-Works Street, and on the Gas-Works Street boundary, is a line of sheds, consisting of main and service layers', blacksmiths', and general workshops, and service-pipe stores, as well as open sheds for storing fire-clay goods.

A gasholder of the capacity required for the completed works is provided for; the remainder of the space being needed for a pipe-yard and coal-stores. Offices and show-rooms, meter-shops, and meter-stores, can (for the want of a better site) be placed at the corner of Gas-Works Street and Leeds Road; while a timekeeper's, coke, and weigh-bridge office is on the right hand of the new entrance in Gas-Works Street.

With regard to the practicability of executing this scheme while maintaining the present production of gas, it of necessity presents points of difficulty, on account of its dealing with the existing buildings and sites, as it would not do to disturb any of the existing plant until we are sure of having other to take its place. With this object in view, the following suggestions are made, which, if carried out, will make us independent of failure to complete a contract or such like contingency, while enabling us to meet present and immediate future requirements.

By adopting inclined retorts, and erecting a bench in the available space in the retort-house of No. 3 section, the production will be increased by 600,000 cubic feet more than was anticipated at the time of its erection. Therefore, it follows that the existing purifying apparatus will, as it now stands, be insufficient to deal with this extra production. The purifiers are only large enough to deal effectively with 1,500,000 cubic feet per diem; and as the retort-house will produce 2,400,000 cubic feet, it follows of a necessity that this plant must be extended—more especially as the existing bench of horizontal retorts would, when requiring renewing, be remodelled on the new plan, which would make the complete retort-house equal to a production of 3 million cubic feet per diem. There are also minor alterations which it will be necessary to carry out, partly necessitated by the increased production, in order to place No. 3 section of the works on a proper footing, full details of which have been prepared.

Unfortunately, there is not room to enlarge the purifiers on the existing No. 3 section, so as to make them sufficient to deal with the eventual production. It is therefore suggested to divide the production of this retort-house—allowing half to be dealt with by the existing plant, while the remaining half would be conveyed to a set of purifiers and other apparatus on the site of the present No. 1 section. These would be capable of dealing with a total volume equal to 3 million cubic feet.

In order that the erection of this plant could be proceeded with, it will be necessary that a portion of the new retort-settings should be worked, so as to enable us to dispense with the production of the No. 1 retort-house; and for the time being, such production from the new settings would be dealt with by the existing purifiers up to 600,000 cubic feet per day, or a little more in case of emergency. Having increased our productive power on the No. 3 section, the No. 1 section could be dismantled for the erection of a set of purifying apparatus, consisting of washers and scrubbers, a set of purifiers and connections, together with a floor overhead on which to revivify the material, with the necessary lifting gear for the covers and mechanical elevators for dealing with the materials.

At the same time that this work was in progress, it would be necessary to erect exhauster and boiler houses on the site on the opposite side of the canal, together with one condenser. This could be all carried out without interrupting the working of the No. 2 section; but in such a manner that, as soon as the plant was ready for work, not only would the 1,500,000 cubic feet per diem be brought from the No. 3 house and passed through the new purifying plant, but also the whole production of the existing No. 2 house.

* The following paragraphs are taken from my report dated March, 1892, to the Gas Committee. The phraseology may, therefore, appear to be somewhat out of date.—W. R. H.

We should then have the work arranged as follows:—

| | Cubic Feet. |
|---|---|
| No. 3 section—production made and purified . | 900,000 |
| No. 3 new section of retorts—production purified on the new section . . . . . | 1,500,000 |
| Total . . . . . | 2,400,000 |
| The remainder of the gas required would be made in the existing No. 2 house up to 1 million feet per day, and also purified in the new section . . . . . | 1,000,000 |
| Total production, winter 1893-4 . . . . . | 3,400,000 |
| Estimated requirements . . . . . | 3,307,500 |

By the above method we should not only, at one stroke, meet the requirements of the Gas-Works Clauses Act, as regards the purity of the gas supplied, but also give ourselves a free hand with No. 2 section; for it would enable us to commence the erection of the new retort-house, by pulling down half the existing No. 2 retort-house, commencing at the north end, and equip it with plant as far as was necessary for the time being.

Beyond the erection of the new bench of retorts in the No. 3 house, and the alterations in the No. 3 section (previously mentioned), this year is lost as regards the further completion of the extensions so urgently needed; and we shall have to face another winter with the existing conditions. It will not, however, be any worse than last, but rather better; as it is intended to adopt a better system of purification as far as the plant will permit. But it must be at additional cost for labour, by having day and night gangs at the purifiers. The fitting of the No. 3 section, as proposed, will put that portion of the total production to rights.

The time and arrangement of carrying out the work would be as follows:—

1892.—Erect new retort-bench No. 3 section in existing house, together with the alterations mentioned—viz., Re-adjust and refit existing hydraulic mains and valves; erect condenser; rearrange purifier connections; new elevator for purifiers; new pumps and connections; prepare plans and contracts for the "Section A" purification plant, &c., &c., to be erected on the existing No. 1 section.

1893.—Pull down No. 1 section. Erect the "A Section" of the extension ready for winter work. Prepare plans for new retort-house.

1894.—Erect portion of new house on site of existing No. 2 section, &c., &c.

1895.—Erect carbonizing plant in new retort-house, to the extent of 1,500,000 cubic feet, ready for winter of 1896. Extensions to gasholders would have to be carried out in same year. Estimated requirements, 1896, 3,828,840 cubic feet; possible production, 3,900,000 cubic feet.

In the year 1895, the capacity of the "A Section" of the purifying plant would be reached; so that the erection of the "B Section" would then have to be commenced, together with a further extension of the retort-house. This is assuming that the rate of increase—namely, 5 per cent.—will be maintained. If otherwise, a year or two's further time will be left.

In the above time-table, no notice has been given to the erection of offices, workshops, stores, and sheds for fire-clay goods. But they do not affect the vitality of the scheme, as these could be commenced and completed straight off, without any intermission, as they are secondary to the manufactory section. By the year 1895, additional gasholder room would be required, more particularly as the existing No. 1 and No. 2 gasholders are in a somewhat worn-out condition. The tanks, however, would be utilized as storeage tanks for tar and liquor. Hence the reason these receptacles have not been previously spoken of. The proposed new gasholder is on the land north of Gas-Works Street, and, when completed, would be capable of storing 5 to 6 million cubic feet.

Thus far I have described the works and the reconstruction scheme in general, as originally formulated. We will now consider what has been actually accomplished.

The oxygen plant and buildings, to produce 30,000 cubic feet per diem, were commenced and in course of erection, as well as workmen's mess and bath rooms and wash-houses, during the year 1892. A new condenser was erected in the tank over the No. 3 exhauster-house. It cost £408 complete, and presents a superficial area of 2888 feet. The purifier connections were rearranged, so as to permit of the gas being passed through four oxide boxes and two limes, or *vice versâ*. As a matter of fact, we use four oxide first, and two limes last, into which we bye-pass a little crude gas. By this means we keep the sulphur compounds within the prescribed limits. The maximum during the past six months was 25·75 grains on the 5th day of May; and the minimum, 15·2 grains on the 17th day of March. The average has been 18·18 grains. We use a small percentage of air or oxygen in the purifiers; and our crude gas into the purifiers contains about 96 grains of sulphuretted hydrogen. We change the lime boxes when carbonic acid is prominent at the outlet of the first; and the oxide, at a trace test on third box.

It may here be interesting to remark that for the past two years nothing but artificial oxide has been employed. Some time ago I was shown round Messrs. Read Holliday and Sons' works; and my attention was drawn to a large heap of what may be termed black mud, but which, in reality, consisted of 93 per cent. purity ferric hydrate. I obtained a small sample for experimental purposes; and the results were so promising that I charged a purifier 17 feet square with 15 tons, mixed with its own bulk of logwood chips. The material was very active even the first time; and, upon testing, it yielded 17 per cent. of free sulphur. The mass became very hot upon exposure. It did not, however, assume the natural colour of bog ore the first time of exposure; nor the second. But the third gave a decided red tinge; and at the fourth, the material could not be distinguished from bog ore. In order to judge when a revivified heap was in a fit state for being returned to the purifier, the temperature of the mass was ascertained by plunging the hand into it.

The following is a statement of results obtained with the first batch of this artificial oxide, alongside of which the results are given of a sample of bog ore, placed in one of the same series of boxes. The results have since been corroborated by more extensive trials:—

*Percentage of Free Sulphur in the Mass.*

| | Read Holliday and Sons' Oxide. Per Cent. | Bog Ore 60 p. ct. Ferric Hydrate. Per Cent. |
|---|---|---|
| After 1st removal from purifier. . . | 17·000 .. | 5·30 |
| „ 2nd „ „ . . . | 26·400 .. | 13·20 |
| „ 3rd „ „ . . . | not tested .. | 21·20 |
| „ 4th „ „ . . . | 31·000 .. | not tested |
| „ 5th „ „ . . . | 35·200 .. | 31·10 |
| „ 6th „ „ . . . | not tested .. | 37·50 |
| „ 7th „ „ . . . | 39·100 .. | 39·80 |
| „ 8th „ „ . . . | 42·630 .. | 41·00 |
| „ 9th „ „ . . . | not tested .. | not tested |
| „ 10th „ „ . . . | 50·177 .. | 45·70 |
| „ 11th „ „ . . . | not tested .. | 49·50 |
| „ 12th „ „ . . . | 52·300 .. | 50·30 |
| „ 13th „ „ . . . | 54·500 .. | 51·00 |
| „ 14th „ „ . . . | 56·100 .. | batch sold |

I have not sold any spent oxide of this class with less than 56 per cent. of sulphur in it; and some has been as high as 70 per cent. The pure material costs us 15s. 6d. per ton in the works; and, after allowing for moisture, it shows a saving of 5 to 1 in favour of this material as against bog ore.

The whole of the retort-fittings and hydraulic mains in No. 3 retort-house were readjusted and fitted with square branch adjustable seal-valves and tar-overflows, to admit of the separation of the heavy tar from the gas, and the maintenance of a liquor seal in the mains. Regenerator furnaces were also erected to the same bench; five being upon Mr. Winstanley's principle, and four erected by our own men.

During October and November of the same year (1892), the whole of the contracts were placed for the following year's work; and there is no doubt we obtained considerable monetary advantage by so doing, as usually a contractor's yard is practically idle during the winter months, while his establishment charges remain the same. He is, therefore, willing to do work at a cheaper rate at this period of the year, in order to keep his works going, and to find employment for his best men. The work turned out during this period is, if anything, superior to that turned out when the workshops are full and busy.

About the middle of December of this year, the brickwork of the inclined retort-bench was commenced. Our own men did the whole of the basement to the ground-level; the remainder from the ground-line upwards being done by contract. The front part of the sloping arch is for a distance of 3 ft. 6 in. thrown from the horizontal line; thus forming a secure abutment at the front for the sloping arch itself to abut against. The arches spring from some special blocks designed for the purpose, the bases of which rest upon the racked portion of the division-walls; while the upper side is formed like a double skew-back, and set to the angle of the intended arch—the brickwork of the division-walls being built on the horizontal line. Owing to the scarcity of room, we could not have the division-walls of a greater thickness than 14-inch; but, in order to reduce the amount of 14-inch work as much as possible, the lower portion of the division-walls was built 18 inches thick to a line parallel with the under side of the bottom sloping retort. The bench was completed, including foundations, main flue, &c., by the end of February, 1893.

The furnaces of these settings are placed on the inner or charging side of the bench, in a space which usually has to be filled in with superfluous brickwork. This method has its advantages in special circumstances; but it is not one to be adopted where a stage-floor retort-house is in question. The whole of the ironwork was erected and completed by the end of July, 1893, and slow fires put in ten of the settings. Along the centre of the charging-stage, a line of gratings was arranged, to allow a good current of air to pass between the back-to-back benches, and just in the position the men stand when charging the retorts. I also removed the ridge-tiling of the roof, and the top course of slates on either side. This not only admitted a good light between the benches, but also induced a quick up-current of air between the stages.

The plant consists of twenty settings of nines, 22 inch by 15 inch by 15 feet sloping retorts; each capable of carbonizing

one ton per day, with six-hour charges. The method of charging is what may be termed the storeage hopper and measuring chamber system; the hoppers being sufficiently large to hold twelve hours' supply of coal. The measuring chambers have adjustable flaps, whereby the weight of the charge can be regulated to the extent of 30 per cent. These chambers are also fitted with Graham's patent check-feed, by means of which it is impossible for the workman to admit any different charge of coal to the retort than the chamber is adjusted for. This is a point of considerable importance, as, during last winter, I found retorts which had been literally filled with coal, while others were only partly charged; whereas now the whole system of carbonizing is entirely out of the workmen's hands. The coal breakers, elevators, conveyors, &c., in connection with this plant were supplied and erected by the New Conveyor Company, of London and Aberdeen. The furnaces and settings are on Mr. George Winstanley's patent principle, and were erected under contract by his men. The cost of this carbonizing plant complete amounted to £13,050, or £72 10s. per ton of coal carbonized. The retort-house area occupied per ton of coal is 50 feet as compared with 109 superficial feet for the horizontal retort-bench occupying the other half of this house.

We were not able to commence the real work of the year 1893 until March, when No. 1 section of the works ceased for ever to be a manufacturing station; and we commenced forthwith to demolish the old buildings and plant, in order to make room for the new plant now erected thereon. Simultaneously with this, the new boiler and exhauster house was commenced, together with the entrance in Gas-Works Street and the weighbridge office, the paving of the yard, and the formation of the new coal-wharf on the No. 3 section of the works. The new land which forms the site of the new gasholder was also completely enclosed by a boundary wall, which has been arranged in such a manner as to allow of the ground-line being fixed 10 feet above the surface level of the field. The tank circle was staked out; and outside its limits we are gradually filling in with our refuse. By this means, we shall save the sum of £5000 when the new tank is constructed.

From March to December, 1893, apart from the new carbonizing plant, the following work was undertaken and completed: Demolition of the No. 1 section of the works. Excavation and foundations for the new purifying house, purifiers, washers, and scrubbers, and tubular bridge. Erection of purifiers and connections, and purifying-house. Re-erection of old tower scrubber, with machinery house added. Erection of Walker's patent washing machine. Two new 28 feet by 7 feet steel boilers and settings. Two 100,000 feet per hour exhausters and engines. 664 feet run of 24-inch steel condensing-tube. One 3 million per day station meter and connections. A battery of tar liquor and water pumps, together with numerous smaller items incidental to the above, and consequent upon the conditions under which the work was carried out.

The purifiers are constructed on the twin-lute principle; there being two boxes, 120 feet long by 30 feet wide, each divided into three, by two division-plates. Each box is 40 feet by 30 feet by 6 feet deep; the bottom plates having internal flanges, and fitted with three tiers of sieve bearers and sieves, although two only are used.

The purifier-covers are lifted by means of hydraulic traversing lifts, one to each three boxes, arranged with four drop-chains, so that they have a direct vertical lift over each of the four lifting eyes attached to the sides of the covers. This prevents any cross-strain when the cover is being lifted or traversed. When the future extension of the purifying plant is carried out (for which there is room for an exactly similar section on the same site), one traverser will serve the line of six boxes. The purifier connections are arranged with Weck's patent centre-valves.

The spent material from the purifiers is elevated to the revivifying-floor by means of elevators at the end of the building, arranged in such a way that the contents of one box can be discharged on the upper floor in a conical heap without any labour being bestowed upon it; it being afterwards distributed by spare labour. When revivified, the material is thrown into canvas shoots passing through the floor, and discharged into any position in the box below. Between the two inner rows of the purifying-house columns, a wrought-iron water-tank has been erected the full length of the building, for service on the revivifying-floors and other purposes. The ventilation of the revivifying-floor roof has been accomplished by dispensing with the ridge tiling; leaving an aperture about 12 inches. The small amount of rain falling through this aperture is no disadvantage.

The first scrubber is supplied, by means of a 4-inch pump, with a continuous flow of the strong liquor obtained from the base of Walker's purifying-machine, which in itself is capable of the complete ammonia purification of 3 million cubic feet of gas per day; the tower scrubber with the strong liquor washing being used to relieve the after process of purification with lime and oxide of iron as much as possible. The tower scrubber is fitted internally with wooden sieves made of 9-inch by ⅜-inch boards, with ¾-inch spaces between, and roughly nailed together. The second tower scrubber now being erected (which has been removed from the No. 2 section of the works) is intended to be used for the recovery of the cyanogen compounds from the gas.

The tubular bridge, which forms the communication between the exhauster-house on the manufacturing side and the plant on the purifying section, passes over the canal, and has a clear span of 66 feet. The bridge consists of a rectangular tube divided into four chambers—two for foul gas, and two for purified gas—each having an area of a 24-inch pipe. On the exhauster-house side, the bridge lengthways is fixed; but on the opposite end, it is free to move by means of faced bearing-plates and turned steel rollers—both plates and rollers being galvanized. From the staircase end of the bridge, the gas passes down the sloping portion, into a distributing box below the ground-line, from which the four divisions of the bridge discharge into four 24-inch pipes with expansion boxes intervening between the cast-iron mains and the connections on the chamber. This chamber also rests upon expansion rollers. The upper staircase, leading to the revivifying-floor, is entirely distinct from the lower staircase, so as not to interfere in any way with the free movement of the bridge.

The exhauster engines are of such power that two additional exhausters can be added in future—one on either side; and, by means of the overhead shaft, either engine can be made to work one, two, or all four exhausters at one time. The floor of the exhauster-house consists of iron plates with faced joints, bolted together, and resting upon steel joists. The whole of the exhauster connections are suspended beneath these; the joints between the mains and exhausters being fitted with expansion boxes.

The various works carried out, under the reconstruction scheme, during 1892-93 were in each year completed within the estimated cost. During 1892, £13,338 was expended. The bulk of this, however, was work in hand from the previous year, and authorized prior to the adoption of this scheme; the chief items being the oxygen house and plant, and upwards of £4000 for trunk mains, consisting of 1¼ miles of 36-inch, among others of smaller sizes. During 1893, £43,400 was expended under this scheme; and the advantages of the improvements in the plant, and the abolition of the use of cannel by the enriching process, had its effect upon our last balance-sheet—there being a balance of upwards of £5000, as against £2418 last year, notwithstanding an additional outlay of about £6000 owing to the coal strike.

The work in process of execution during this year (1894) comprises the demolition of one-half of No. 2 retort-house, together with the whole of the purifying plant on this section of the works; and the erection of half of the new retort-house—the portion now being erected measuring 175 feet long by about 90 feet wide. The building is to be covered by an elliptical girder roof, in order to give as much room in the interior with as low side walls as possible. The retort-house when completed will contain sixty settings of inclined retorts, and be equal to the production of 5½ million cubic feet of gas per diem. At present twenty-four settings are to be erected, to be ready for work in the autumn of 1895. A new chimney—7 feet bore 70 yards high—is in course of erection at the end of the exhauster-house, which is intended to serve with the boilers and retort-furnaces.

Some difficulties have been experienced in securing suitable foundations at a reasonable depth for the new retort-house walls; and, in order to avoid the expense of carrying the walls below ground a distance of from 17 to 18 feet, the superstructure is being built upon brick arches abutting upon concrete piers, having bearings upon the solid ground, the crown of the arch being 9 inches below the ground-line.

On a site parallel with, and adjoining the new retort-house, a new oil-gas works is being erected, which is to be worked in connection with the oxygen process. Contingent to this, a new governor-house, with two of Cowan's 24-inch governors, is being erected to replace the existing building now within the new retort-house walls. An oil storeage tank, capable of storing 100 tons, is to cover the new governor-house; and it will be filled by means of a pipe-line conveying the oil from the railway siding, about three-quarters of a mile distant, to the works. The siding being at a higher altitude, the storeage tanks are filled by gravitation.

The end wall of the new retort-house approaches to the boundary of Gas-Works Street, a road which divides the works into two. Under this road, a subway was formed last year, so as to communicate with the new coal-stores on the opposite side. The coal-store is to be spanned by the old retort-house roof, and covered by corrugated sheet iron. Adjoining the coal-stores a disused log-wood mill is being converted into general stores, and communication obtained therewith by means of a bridge across the coal-wharf extensions. At the back of the new stores, provision is being made for receiving and storing fire-clay goods and retorts delivered by canal. The coal-stores are also arranged to utilize the canal to a similar advantage; provision being made to adopt machinery for unloading the boats. Immediately facing the new coal-stores, on the right-hand side of the entrance, new workshops and a coal-testing station are also in course of erection.

I have mentioned but a few names of firms who have been associated with the works carried out, and those only who have supplied specialities. In all other cases, full detail drawings and specifications were supplied to the various contractors by us.

In closing this paper, a few up-to-date facts with regard to the working of the oxy-oil process will, no doubt, be of interest to you. The process has now been in continuous work for about twelve months, and continues to give unqualified satisfaction;

the whole of our enrichment, up to 18½ candles, being obtained from this source.

I have found that it is better to state results by the weight of oil used per 100 tons of coal per candle of enrichment, rather than by percentage of enriching gas added. The yield per ton of oil must not, however, be neglected as a practical daily guide; but my experience teaches me that the yield can be varied considerably within given limits without affecting the ultimate results of enrichment. Our working standard is 27,500 cubic feet per ton of oil of 70 actual candle power, and having an enriching value of 132 candles.

During the month of July, we used 5¼ cwt. of oil per 100 tons of coal per candle of enrichment, at a cost of 18s. 6d., or 0·21d. per candle-thousand. The following are the working results for July last:—

| | |
|---|---|
| Coal carbonized | 1918 tons. |
| Oil used, at 67s. 6d. per ton | 14 t. 15 cwt. |
| Production of gas | 20,751,000 cub. ft. |
| Production per ton of oil and coal | 10,736 ,, |
| Illuminating power before enrichment | 16·00 candles. |
| Illuminating power supplied | 18·71 ,, |
| [Tested on Board of Trade photometer.] | |
| Cost of material only for enrichment— | |
| Oil 0·21d. | } 0·29d. per candle-thousand |
| Oxygen 0·08d. | |

These figures show that the permanent enrichment of coal gas can be accomplished for an expenditure on material of practically ¼d. per candle per 1000 cubic feet. The arguments, therefore, as to the cost of enrichment being such as to make it advantageous for consumers that enrichment should be abolished altogether, and low-grade gas from coal alone supplied, will need greater force than has yet been given them, before the public will accept such a suggestion from the suppliers of gas.

I have recently been engaged upon testing various samples of oil, with a view of making the ensuing twelve months' contracts. One fact is very satisfactory. We can buy oil for the coming twelve months at £3 per ton, as against £3 7s. 6d., the present price. The oil-testing plant is an improvement upon our present oil-gas plant, and treats the oil upon an entirely different principle to that hitherto practised. That the principle is correct can be seen by reference to the following tabulated results of experiments with this plant, which is on such a scale of working that it is a unit of what a large plant would be, in just the same way that a setting of (say) five retorts is a unit with ordinary coal gas manufacture. The conditions, therefore, under which each test was made approach very nearly, if not quite, to practical working conditions:—

*Statement of Results of Tests of Various Oils.*

[Oxygen was not used when making these tests.]

| Class of Oil Used. | Specific Gravity. | Gallons of Oil per Ton. | Quantity of Oil used in Gallons. | Total Cubic Feet of Gas Made. | Yield of Gas per Gallon of Oil. Cubic Feet. | Yield of Gas per Ton of Oil. Cubic Feet. | Illuminating Power of Gas.* Candles. | Foot-Candles per Ton of Oil. | Equivalent to Sperm per Ton of Oil in Pounds. | Percentage of Coke. |
|---|---|---|---|---|---|---|---|---|---|---|
| *Scotch.* | | | | | | | | | | |
| A | ·873 | 257·00 | 7·25 | 725 | 100·00 | 25,700 | 65·66 | 337,492 | 5785 | 3·1 |
| B | ·837 | 267·60 | 7·50 | 741 | 98·80 | 26,438 | 66·08 | 349,404 | 5990 | 2·5 |
| C | ·870 | 257·47 | 13·00 | 1242 | 95·00 | 24,460 | 68·17 | 333,487 | 5740 | 3·8 |
| D | ·870 | 257·47 | 7·50 | 597 | 79·60 | 20,494 | 70·16 | 287,571 | 4930 | 3·5 |
| *American Lighting.* | | | | | | | | | | |
| E | ·822 | 272·50 | 15·00 | 1150 | 76·66 | 20,890 | 65·00 | 271,570 | 4655 | 2·3 |

* Tested on Board of Trade photometer against a 2-candle Methven screen and a No. 10 Bray burner.

The small percentage of residue obtained by this plant may, at first sight, appear remarkable; but when it is remembered that, in the first instance, we start with a fluid which has been condensed from vapours driven off from a solid material by the application of heat, it is surely not unreasonable to expect to be able to again vaporize practically the whole of this condensed fluid, and from vaporizing to gasifying is only a short step indeed if the right direction is taken. This gas was also repeatedly tested for its permanency, which was found to be absolute; one sample of 125 feet being left in a small gasholder with 110 feet of skin furnace and an area of 16½ feet over water for six weeks, with the result that the illuminating power had fallen from 55 to 53·84 candles. I have also used our coal tar in the same plant; and the results obtained therefrom are so remarkable that I do not propose to speak of them until I have been able to still further satisfy myself as to their accuracy.

The PRESIDENT said it was not proposed to discuss at the present meeting the paper to which they had just listened. Any points in the paper, however, that lent themselves to discussion could be taken up at their next meeting—in November. They would adjourn for the purpose of inspecting the works; and this would be specially interesting after the paper.

The meeting adjourned accordingly; and, after the party had been photographed, they proceeded to inspect the works, the chief features of which are described in the paper. From the gas-works they crossed the street to the electric light works, where an inspection was made of the generating plant, which has now been in operation for about two years. Mr. F. Calvert, the Chairman of the Electric Supply Committee, and Mr. A. B. Mountain, the Electrical Engineer, received the visitors.

Luncheon was afterwards served at the George Hotel; and at its close one or two votes of thanks were passed.

Mr. W. R. CHESTER (Nottingham) said he submitted a proposal which he felt sure would meet with hearty concurrence. It was that the best thanks of the Institution be given to the Gas Committee of the Corporation of Huddersfield for their kindness in permitting the members to go over the gas-works and the electric light works. From what they had seen, they could bear witness that the Corporation had as their Gas Engineer a gentleman of considerable experience, who had given proof of his abilities in the various works he had undertaken during the past two or three years. It was not too much to say that the gas-works at Huddersfield had in that time been completely metamorphosed. The Corporation were in the proud position of being able to supply gas of 18-candle illuminating power at a lower cost than they could supply 16-candle gas. The members had inspected the works with great satisfaction; and it only remained for them to tender their thanks to the representatives of the Corporation for their kindness.

Alderman STOCKS briefly replied. He expressed a hope that the members of the Institution would again visit the works when their reconstruction was completed.

On the motion of Mr. T. B. BALL (Rochdale), thanks were accorded to Mr. Herring for his admirable paper.

Mr. HERRING acknowledged the compliment.

Conveyances were in waiting outside the hotel; and in these the members and their friends were taken to the new reservoir now being constructed for the Corporation at Butterley—seven or eight miles from the town. Particular interest was shown in a puddle trench, 175 feet deep, at present being proceeded with across the valley. It has been necessary to go down with the trench about 60 feet farther than was proposed at the outset, owing to the unsatisfactory strata at the point where it was originally intended to stop. Particulars with regard to the trench and the other features of the works in course of construction were courteously given by Mr. Alderman Crossland, the Chairman of the Water Committee of the Corporation, and also by Mr. Hughes, the Resident Engineer. About £60,000 has already been expended on the works, which are expected to cost £200,000 or £250,000 in all.

On the way back to Huddersfield, a halt was called at Blackmoorfoot to inspect the reservoir there, which has an area of 105 acres, and is the largest reservoir belonging to the Corporation. The grounds surrounding the reservoir here are beautifully laid out.

On reaching Huddersfield, tea was partaken of at the George Hotel; and the proceedings were afterwards brought to a close a vote of thanks, accorded on the motion of Mr. BRADDOCK, to Mr. Alderman Crossland, for his assiduous attention to the visitors during the afternoon.

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**Wooden Water-Mains.**—Wooden water-mains, the use of which is now being revived in some of the western cities of the United States, where wood is cheap and iron dear, have been used in Tokio for upwards of 200 years. In that town the pipes less than 6 inches in diameter are bored out of the solid, while larger pipes are built with planks, and are usually square.

**Fire Caused by an Incandescent Electric Lamp.**—In a recent number of *Fire and Water*, an account was given of a fire in the business portion of Victoria (B.C.), which caused damage to the extent of $15,000. It was remarked that the records would have shown the origin of the fire as "unknown," but for experiments made after it was extinguished. In the upper storey of a dry goods house, several 32-candle power incandescent lights were installed. One of the lights was connected with a long insulated wire, and some feet of the spare wire allowed of the moving of the light from one portion of the room to another. Through ignorance or carelessness, the globe was laid on a pile of goods; the fire occurred shortly after the light was turned on at the supply station. The tests were made in the room where the fire originated, and were reported as follows: "There is no longer the slightest doubt as to how the fire started, as two tests have shown that the incandescent light will ignite cloth."

## NORTH OF IRELAND ASSOCIATION OF GAS MANAGERS.

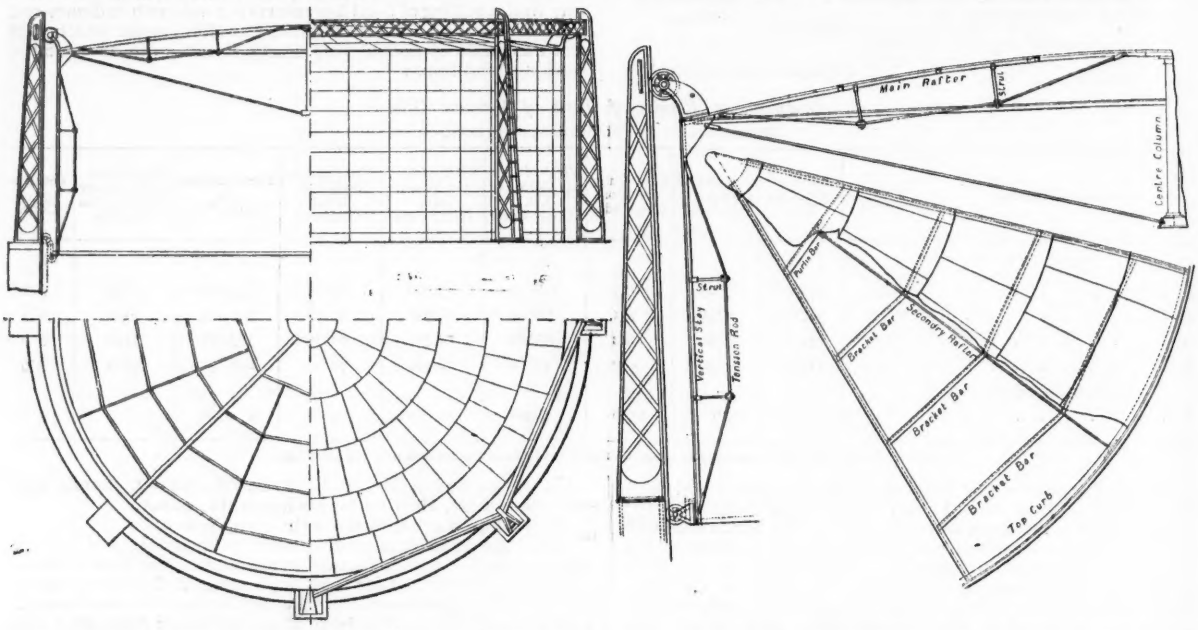
### The Annual Meeting in Armagh.

In the JOURNAL last week, we published a report of the general business at the above meeting. We now give the two papers read on the occasion, with the discussions thereon.

Mr. W. B. FEATHERSTONE (London) read a paper entitled—

### A FIFTY-FEET DIAMETER GASHOLDER.

In writing this paper, I am trying to provide, for future reference, a drawing of a gasholder, with particulars necessary to make and erect it. The drawing shows a general sectional plan and elevation to a ½-inch scale, also a section and quarter plan of the framing and sheeting to a ¾-inch scale. I will take as a basis a gas-works making 100,000 cubic feet of gas per day of 24 hours, with a storeage capacity of (say) 60,000 cubic feet. Another 40,000 cubic feet of storeage is immediately required, and provision has to be made for an extra 40,000 cubic feet




to economically meet an increase of business. Thus the tank must be made large enough to enable an outer lift to be added when required, without cutting the gasholder about. For convenience in stock-taking, each sheet depth is to hold 4000 cubic feet when the holder is telescoped and full up with gas. This gives a diameter of 49 ft. 9 in. and a depth of 20 feet for the inner lift; and a diameter of 51 ft. 3 in. and a depth of 20 feet for the outer lift—equal to 162 cubic feet per inch depth for the inner lift, and to 172 cubic feet per inch for the outer lift. The rise of the crown—2 ft. 6 in.—is made one-twentieth of the diameter.

The various sections of iron used are quite strong enough, as compared with gasholders that have worked satisfactorily for years past. Taking 16 lbs. per square foot for wind pressure, this would not give more than 7 tons 3 cwt. on the holder—16 lbs. by 20 ft. by 50 ft.—or at the most a 4-ton strain on the standard in the line of the wind pressure; and a foot of snow will not, at 5 lbs. per foot, equal 5 tons on the whole crown of the holder. Reckoning wrought iron to work under 5 tons tension and 4 tons compression, the sections need not be heavy. Of course, it is necessary to properly strut the rafters or stays, because beyond fifteen times the depth of a rafter the strength decreases as the square of the span. Thus a rafter strutted at 10 feet apart is only one-fourth as strong as a rafter strutted at 5 feet apart. Again, increasing the thickness of a rafter (say) from ½ inch to ¾ inch simply adds strength in that proportion—that is, it is only half as strong again; but if you increase the depth of a rafter, you increase the strength as the cube of the depth by the width. Then, the spans being equal, a 3 inch by ⅜ inch rafter increased to 4 by ⅜ inch is increased as 27 : 64. The strength of the rods is as the square of the diameters in quarter inches, and 1-inch rods should not break under a less strain than 16 tons; and half this is very nearly the weight of a yard, or 8 lbs. Of course, the strain on a tension-rod varies according to the angle at which it supports the strut. (See Bow on "Economics of Construction," and Cripps on "Gasholder Strains.")

When the time comes to telescope the holder, the part shown in dotted lines on the drawing is to be added. A bent plate, with bead to stiffen the edge, will form the cups when riveted to the angle-iron bottom curb of the inner lift. The shape of this cup, designed by Mr. H. O'Connor, of Beckton, will prevent dirt lodging beneath the grip. It is readily fixed, and will require less than half the riveting of angles and plates. The grip is of the usual pattern, known as Piggott's; and it is convenient to clean out in frosty weather.

The specification and quantities are arranged in the order in which the material will be wanted for erection. Thus the bottom curb, strong row of plates, and vertical stays come first to be placed in position, &c. It is best, when it can be managed, for the engineer to personally inspect the work as it is put together in the yard of the contractor; carefully noting the marking, and particularly measuring the rise of the crown. Never mind whether the holder is made to the 32nd part of an inch; but have it erected according to the shop templates. Before the holder is placed in the tank, carefully trammel, and set the tank guides vertical. You cannot place any reliance upon the figure of the tank; so pack the guides true independently of it, and then you can measure from them in setting out the curbs. Get your top and bottom strong row of side plates all round before making a permanent joint anywhere; also get at the run of the top plates right across the crown at right angles before commencing to rivet it up, so as to get the holes all fair. Both the side and top sheets should be well stayed or strutted to their true curve before any riveting is done. The guide-framing is intended to be taken down and re-erected upon the standards and girders specially provided when the holder is telescoped; and then bracing can be added if the holder is much exposed to strong winds.

There are several so-called improvements to an ordinary gasholder. The curved curb of Mr. Wyatt looks very well—the curb being in one piece; but I should not use it for so small a holder as this. Mr. Wyatt also breaks joints with all his side sheets, and fits strong girder framing in the holder; while Mr. Trewby employs skeleton timber framing fixed in the tank, which comes into action when the holder is down. Mr. Cutler makes all his top plates rectangular, each breaking joint and cutting off the corners to fit in with the strong row of the curb. He also has a peculiar curved system of standards and girders. Mr. Paddon ties together the tops of alternate standards, and struts out the intermediate one—a plan known as "Paddon's wind ties." Mr. Livesey is responsible for a seal to the manholes over the inlet and outlet pipes. A tube is riveted to the crown, and fits over the inlet and outlet pipes; sealing the lower end in the tank water when the holder is down, so that one can clean out the pipes without losing the gas in the crown. In small works, these might be awkward about 11 p.m. if the holder grounded, as the gas being made would bubble through the water in the tank, and give back pressure. Of course, you would not have the weight of the holder to contend with.

With reference to the strain on the standards due to wind pressure, if there were no girders, the strain on the base would be increased in the proportion of the depth from back to front to the height—say, eight times. This would bring the 4 tons to 32 tons as the strain on the base, which would require about 6½ inches of section. But the holder assists the girders in forming a wind-tie; so that it would be safe to take the strain on the tank at 8 tons, or not 2 inches of section.

In estimating for a gasholder, first make out a regular inventory—a complete summary of the work to be done. Place opposite each section of iron used the weight per foot run or superficial, as may be required. Count the number wanted of each member, and mark it plainly. Say eight rafters are used, when you measure off the plan the length of one, it is plainly to be seen that this must be multiplied by 8. In taking off the curbs, put down the circumference and weight per foot run. In taking out the weight of the crown, note the extra length over

the span for the rise of the crown, and mark concentric rings for each variation in the thickness of the sheets. Thus for the outer row of crown sheets, take the area of the whole crown, and deduct the area of all the inner rings—of course, noting any special plates under the carriages, &c. The drawing is of a telescopic gasholder, of 58,000 cubic feet capacity, now in course of construction at Seaford by Messrs. C. and W. Walker, of Donnington. The cost, with concrete foundations, steel tank, inlet and outlet pipes, guide-framing, &c., constructed above ground, with platforms, ladders, &c., delivered and fixed complete, is £1900. To save contractors' expenses, the engineer may give particulars of the distance from railway or canal, cost of cartage, and state if there is any convenience for unloading, if scaffolding (such as poles, planks, &c.) can be hired, and also if the material can be stored handy to site.

## SPECIFICATION OF A SINGLE-LIFT GASHOLDER.

### General Conditions.

*Contract.*—The contractor will supply, deliver, and erect a new gasholder and guide-framing, all as described in this specification and shown upon the drawing; also provide all tools, tackle, scaffolding, and labour that may be necessary for the efficient performance of the contract.

*Setting-Out Works.*—The contractor must set-out the works, as he will be responsible for any error in the form thereof.

*Works Carried on Under Control.*—All the work herein specified, or shown on the drawing, and all additions and alterations thereto that may be found necessary to be done and executed, will be under the direction, and completed in every respect to the satisfaction of the directors of the company or their engineer, or any person duly authorized to act on behalf of the company.

*Materials.*—All materials forming component parts of the structure delivered upon the company's premises are to become the property of the company, and shall not be removable without the engineer's consent. And if any materials are at any time disapproved of by the engineer of the company, the contractor shall, at his own expense, within 48 hours, remove and replace them by others of a quality that shall be entirely satisfactory to the engineer, and stand any test he may consider necessary. Should the company or the engineer consider it desirable to alter any portion of the work, by adding to or diminishing the amount thereof, or exchanging one kind of material for another, thus deviating from what is delineated on the contract drawing and stated in this specification, the same shall not vitiate the contract, but shall be executed under the conditions of this specification, and measured up and paid for at the schedule of prices annexed hereto, or, where no price is offered for the work, the same shall be valued by the engineer, whose opinion thereon shall be final. The value of such works shall be accordingly added to, or deducted from, the amount of the contract.

*Monthly Statement and Advice of Materials.*—The contractor shall furnish the engineer of the company with a monthly statement, dating from the first delivery of material until the final settlement and completion, of all extras and departures from the contract; and every consignment of materials, in whatever quantity, forming part of the works, must be clearly described upon advice-notes supplied by the contractor previous to the delivery upon the company's premises, and such advice-notes must also be contained in a note supplied with the monthly statement.

*Damage to Works.*—The contractor must guarantee the company harmless against all accident or damage to the company's property or works, or the properties or works of others, during the progress of the contract, and incidental thereto; and any resulting expenses or damages which may be incurred by the company on account of any action which may be defended by them, the contractor shall pay on demand to the company, or the same may be deducted from any balance due to the contractor by the company.

*Progress of Works.*—Should the progress of the works not be deemed satisfactory at any time by the engineer, he may put on more force and material to expedite the same; and, in so doing, he may use the contractor's plant and material on the ground, and deduct the cost of such proceedings from any balance due to the contractor. Such operations on the part of the engineer will not relieve the contractor from any liabilities under the contract. The engineer may direct the removal of any foreman or workmen from the works if he considers it advisable; and none of the work shall be sublet without his consent.

*Maintenance of Works.*—The contractor shall maintain the work in an efficient state for twelve months from the time of completion, as certified by the engineer, and shall then hand it over to the company sound and efficient; making good all defects, failures, accidents, and damages during that time, from any cause whatever. Any reparation performed by the company during the maintenance, in consequence of the contractor failing to do it, shall be charged to the contractor.

*Measurements.*—All measurements for quantities and estimates will be based upon the net dimensions shown on the drawings.

*Communications.*—Written notices sent by post or hand to any place of business or private residence of the contractor, or his representative, or his foreman, shall be sufficient from the engineer.

*Stoppage of Operations.*—Should the engineer desire to stop the progress of the works, the contractor shall suspend operations directly after receipt of a written notice, and recommence immediately the engineer requires him to do so; and any such action of the engineer shall be considered a part of the condition of the contract. But the engineer can, at his discretion, allow an extension of the time for the completion of the contract.

*Completion.*—Should the works herein specified and shown on the drawings not be completed by the day of , the contractor offers to perform the work at a reduced cash price equal to one-half per cent. off the original offer for each week the work remains unfinished.

*Arbitration.*—In case any doubt, question, difference, or dispute shall arise at any time during the progress of, or after the completion of the works, as to the meaning of any part of these presents, or of the said plans and specifications respectively, or as to any other matter or thing connected with the contract, the same to be referred to an arbiter, mutually chosen, or, in case of disagreement, appointed by the sheriff of the county, on the petition of either party; and the arbiter's decision shall be final and binding on both parties.

*Quantities.*—The quantities given hereafter in the schedule are deemed sufficient to complete the works according to the drawings and specification; and the contractor will have to satisfy himself of the correctness thereof before signing the formal contract with the company.

*Payments.*—Payments will be made upon receipt of the engineer's certificate as follows: One-half the amount of the contract upon delivery of all the material necessary to complete the contract; one-third upon completion; 10 per cent. in three months; and the balance in months after the completion of the contract.

*Proposals.*—Proposals to be sent in on or before the day of next, at o'clock. The contractor shall, if required, find sureties for the proper performance of the contract in the sum of who will be jointly and severally bound to this amount. The directors do not bind themselves to accept the lowest or any tender.

*Tenders.*—Tenders are to be addressed to endorsed "Tender for Gasholder."

### Quality of Materials.

*Cast Iron.*—The cast iron to be composed of equal parts of No. 1 and No. 3 pig iron, to be melted in the cupola, free from impurities. The castings must have no imperfections, such as cold shuts, cracks, or flaws, and to be cast with the heaviest part downwards, vertical, or at an angle not less than 45 degrees. A bar run from the cupola from which the castings are prepared, size 2 inch by 1 inch, and 3 ft. 6 in. long, with a clear bearing of 3 feet, must stand 30 cwt. at the centre. The end joints and fitting parts to come metal to metal, perfectly true and level. All holes to be carefully cast or drilled to true templates, so as to make a neat strong joint.

*Wrought Iron.*—The whole of the wrought iron shall be equal to No. 3 best Staffordshire brand, and must stand a tensile strain of 22 tons per square inch of section for plates, angle, tee, or bar iron; but the rivets and bolts must stand a tensile strain of 20 tons per circular inch section. There must be no permanent set in the iron at a strain of 10 tons per square inch of section in tension. All holes to be drilled or punched to true centres (barely the diameter of the rivets or bolts), and rhymered to the exact size when in position.

### Schedule of Quantities.

| — | Description. | Weight. | Rate per Cwt. | Amount. |
|---|---|---|---|---|
| | *Wrought Iron in Gasholder.* | T. c. q. lb. | | £ s. d. |
| Bottom curb . | Circumference 157 ft., at 7·66 lbs. + covers . . . . | 0 12 0 0 | 16/- | 9 12 0 |
| Top curb . . | Circumference 157 ft., at 9·53 lbs. + covers . . . . | 0 14 2 16 | 16/- | 11 14 4 |
| Lower side plates . . | Circumference by depth, at 8·8 lbs. per foot . . . . | 1 4 2 7 | 20/- | 24 12 6 |
| Vertical stays . | No. 8 by length, at 7·03 lbs. per foot, and trussing . . | 0 13 3 17 | 16/- | 11 2 5 |
| Side sheets . | Two rows, circumference by depth, at 4·36 lbs. . . . | 1 4 1 8 | 18/- | 21 17 8 |
| Do. do. . | Seven rows, circumference by depth, at 2·88 lbs. . . | 2 16 1 0 | 18/- | 50 12 6 |
| Centre col. and truss cup . | Complete . . . . . | 0 2 0 0 | 20/- | 2 0 0 |
| Main rafters . | No. 8, each 23 ft. long, at 7·03 lbs., and trussing, &c. . . | 1 0 2 22 | 16/- | 16 11 0 |
| Secondary do.. | No. 8, 18 ft. 6 in., at 4·48 lbs. per foot . . . . . | 0 5 3 4 | 16/- | 4 12 7 |
| Purlin bars . | No. 8, 6 ft. 3 in., at 6 lbs. per foot . . . . . | 0 3 0 0 | 16/- | 2 8 0 |
| Bracket bars . | No. 8 sets, at 2·38 lbs. per foot . . . . . | 0 3 1 17 | 16/- | 2 14 3 |
| Plates and straps . . | Say . . . . . | 0 1 0 0 | 20/- | 1 0 0 |
| Crown outer row . . . | Strong plates under carriages, at 8·8 lbs. . . . . | 0 11 0 0 | 18/- | 9 18 0 |
| Do. do. . | Ordinary area = 376 ft., at 4·8 lbs. . . . . | 0 16 0 13 | 18/- | 14 10 3 |
| Crown light sheets . . | Ordinary area = 1466 ft., at 3·32 lbs. . . . . | 2 3 2 0 | 18/- | 39 3 0 |
| Crown centre sheets . . | Ordinary area = 20 ft., at 5·36 lbs. . . . . | 0 1 0 0 | 18/- | 0 18 0 |
| Manholes . . | Two manholes, at 56 lbs. each | 0 1 0 0 | 60/- | 3 0 0 |
| Handrail . . | Fitted complete . . . . | .. | .. | 17 0 0 |
| Rollers and carriages . | Eight goosenecks on top curb, at 2 cwt. each . . | 0 16 0 0 | 20/- | 16 0 0 |
| Do. do. . | Eight bottom rollers and carriages, at 1 cwt.. . . . | 0 8 0 0 | 20/- | 8 0 0 |
| Sundries . . | Add laps and rivets . . . | 1 6 3 8 | 20/- | 26 16 3 |
| Standards (8) | Say 6 cwt. 2 qrs. . . . . | 2 12 0 0 | 20/- | 52 0 0 |
| Girders (8) | Say 4 cwt. . . . . | 1 12 0 0 | 20/- | 32 0 0 |
| Bolts . . . | .. | .. | .. | 5 0 0 |
| Girders. . . | .. | 2 15 2 0 | 16/- | 44 8 0 |
| | | 22 4 2 0 | .. | 427 10 9 |

Estimate for gasholder, single lift, 49 ft. 9 in. diameter and 20 feet deep, with standards and girders, is (say) £430.

### Gasholder.

*Dimensions.*—The gasholder to be a single-lift, 20 ft. deep from the under side of the angle-iron bottom curb to the top of the angle-iron curb of crown framing, and to form a true circle on plan 49 ft. 9 in. diameter. The crown to form a true segment of a sphere, having a rise of 2 ft. 6 in. at the centre.

*Tank Guides.*—Sixteen tank guides are to be (fixed eight only required for the single lift), to the tank wall, each in four places, by means of wings (countersunk), riveted on to the guides, which are bolted to stones by Lewis bolts and nuts.

*Bottom Curb.*—Angle-iron 3 in. by 3½ in. and ⅝ in. riveted to bottom row of the side plates by ⅝ in. rivets, 2½ in. pitch; butt joints, and cover plates 2 ft. long by 3 in. by 2½ in. with ⅝ in. rivets.

*Section Plates.*—No. 5 B.W.G., riveted by ½ in. rivets, 1¾ in. centres, and 1½ in. laps.

*Vertical Stays.*—Eight (8) vertical T-iron stays, 3 in. by 3 in. by ⅝ in., riveted to the top and bottom angle-iron by ⅝ in. rivets, and to the corner plate at the junction of the main rafters, by ⅝ in. rivets, 2½ in. pitch.

*Trussing.*—The bowstring trussing to be ¾ in. diameter for the tension-rods, and 1 in. diameter for the struts; eyes, jaws, and double nuts to be fitted as required.

*Side Sheets.*—Top row to be No. 12 B.W.G.; bottom row, No. 5 B.W.G.; second row from bottom, No. 12 B.W.G.; and intermediates, No. 15 B.W.G. No. 12 gauge to have $\frac{5}{16}$ in. rivets, 1¼ in. pitch, 1 in. laps; and No. 15 gauge, ¼ in. rivets, 1 in. laps.

*Top Curb.*—Angle-iron opened to rise of crown of 4 in. by 4 in. by ⅝ in. in eight lengths, butting evenly together, with cover plates 2 ft. long by 3 in. by ½ in. section, riveted on by ⅝ in. rivets, 3 in. pitch.

*Centre Column.*—The centre column is to be 8 ft. long and 8 in. diameter, of wrought iron $\frac{5}{16}$ in. thick, and top and bottom angle-irons of 2½ in. by 2½ in. by ¼ in. riveted to the crown plate by ⅝-in. rivets, 4 in. pitch, and to the main tension truss cup.

*Truss Cup.*—An inverted cup of ½ in. wrought iron, stamped to shape, and drilled to receive bolt to the main tension-rods, with double nuts and washers specially fitted, and to have a 1 in. by ½ in. half round bead shrunk and countersunk riveted to the lower edge.

*Crown Plates.*—A top and a bottom plate 3 ft. 6 in. diameter of No. 5 B.W.G. riveted to the centre column, and bolted to each main rafter, by 1-in. bolts, but independent of the sheeting.

*Main Rafters.*—There will be eight main rafters, of 3 in. by 3 in. by ⅝ in. T-iron, in one length, bolted by eye-straps to the crown plates, and riveted to the curb and corner junction plates by ⅝ in. rivets, 2½ in. pitch.

*Junction Corner Plates.*—Two plates connecting the vertical stays to the rafters 1 ft. 9 in. by 1 ft. 9 in., as shown, of No. 10 B.W.G., with 4 in. by ⅝ in. strip riveted between by ¾-in. rivets, 4 in. pitch, zig-zag, to which the main tension-rod is to be bolted. The strips must evenly bite both curb and stay.

*Purlin Bars.*—The purlin bars to receive the ends of the secondary bars 3 in. by 3 in. by $\frac{5}{16}$ in. angle-iron, bent 6 in. at the ends, and bolted to the main bars by two bolts ⅝ in. diameter.

*Secondary Rafters.*—These to be of flat iron, 3 in. by $\frac{7}{16}$ in. thick, bolted to the purlins by two straps 12 in. long by 2½ in. by ¼ in., bent 6 in., and two bolts ⅝ in. diameter through the purlins.

*Bracket Bars.*—All bracket bars to be 2 in. by $\frac{3}{16}$ in. wrought iron, bent 3½ in. at the ends, and bolted by two bolts ⅝ in. diameter to the main and secondary rafters.

*Crown Sheets.*—There are to be eight plates, one under each roller carriage, of No. 5 B.W.G.; the remainder of the outer row, of No. 11 B.W.G.; the crown centre, of No. 10 B.W.G.; and the remainder, of No. 14 B.W.G.

*Manholes.*—Two manholes are to be fixed in the crown—one near the centre, and one over the inlet and outlet pipes; to be oval shaped, 1 ft. 9 in. by 1 ft. 6 in. diameter. A strip 2½ in. by $\frac{3}{16}$ in. is to be riveted round the hole in the plate by ½ in. rivets, 4 in. pitch, countersunk. The covers to be of No. 10 B.W.G., with a strip to match the one round the holes; ⅝ in. bolts, 4 in. pitch, fasten the covers down—the bolt-holes being tapped as for the set pins in the crown strip.

*Roller Carriages.*—Eight gooseneck carriages, with cast-iron rollers 1 ft. 6 in. diameter and 3 in. thick, turned on the facet, and wrought-iron cheeks of No. 5 B.W.G., with 2½ in. by 2½ in. by ¼ in. angle-iron frame round the edge, and a 1-in. bolt and cast-iron washer distance-piece to pass through the cheeks. Two ¾-in. strips, 2½ in. wide, are to be countersunk, riveted to the strong plate of the curb; and a bed-plate for the carriages ½ in. thick, 1 ft. 9 in. long, and 12 in. wide, with slot-holes to adjust the carriage, to which they are to be bolted, is to be riveted on through the strips by ¾-in. rivets, 2½ in. pitch.

*Turned Axles.*—Special case-hardened axles, 1⅛ in. diameter square necked, with split pins through nuts and bolts, to be provided.

*Bottom Rollers.*—Eight bottom rollers, 12 in. diameter and 3 in. broad, 1 in. thick, 4 in across the boss, turned and bored, with wrought-iron side cheeks ⅝ in. thick, and 2½ in. by ¼ in. strengthening strips thickened up to ⅝ in. at the bosses and axles 1⅛ in. diameter, case hardened square necks, with split pins through the bolts and nuts. A distance-strip 1 ft. 6 in. by 3 in. by ⅝ in. to be riveted to the strong row of bottom plates to which the carriage will be bolted, as well as to the curb, by four bolts ¾ in. diameter.

*Handrail.*—A handrail, with standards about 6 feet apart, of wrought-iron tubes 1 in. diameter, fitted with tees for ¾-in. rail, and tapped to the curb by flange and socket pieces.

*Testing.*—The contractor must fill the gasholder with air, and allow it to stand seven clear days, after being worked to try the rollers, &c.; and when proved sound, as required, then filled with gas, and must stand sound for seven clear days—all defects being remedied.

*Painting.*—The whole of the wrought ironwork to be dipped in hot boiled linseed oil, and after erection to receive two coats of best oxide of iron paint; samples to be submitted for approval.

*Inspecting.*—When the gasholder is complete and marked ready for erection, the engineer shall be notified; and he may visit or send a deputy to the contractor's works to thoroughly inspect and take particulars or mark or stamp the material used in this contract.

*Tank Filling.*—The company will fill the tank once, when called upon by the contractor's within a reasonable period; but if the gasholder is faulty, and the tank requires emptying or refilling, the contractor must do so at his own expense.

### Guide-Framing.

*Standards.*—There shall be eight standards of wrought iron 22 ft. 6 in. long, and 2 ft. 6 in. deep at the base, vertical in front, and tapering to 1 ft. at 21 ft. 6 in. in height. The width shall be 5 in. in the front, forming guides, and shall taper at the back from 1 ft. 4 in. at the base to 4½ in. at the top. Specially cut ½-in. plates at top and bottom to be riveted to the angles of 2½ in. by 2½ in. by ½ in., as shown; and the lattice bars to be 2½ in. by ¼ in. The top angle bent over, and welded in one piece on the back, spaced between the lattices. Eight strips, 2½ in. by ½ in., shall be riveted to the angles.

*Lattice Girders.*—These are to be 1 ft. 6 in. deep, with top, bottom, and end angle-irons in one piece 2½ in. by 2½ in. by ¼ in., with lattices 2½ in. by 2½ in. by ½ in. The girders to be neatly fitted and bolted together through the web plate of the standard by four ⅝-in. bolts on each side.

*Channel Guides.*—The guides for the top carriages to the inner lift of 5 in. by 2½ in. by ⅝ in. T-iron, shall be riveted to the standards by ⅝ in. rivets, 6 in. pitch, and firmly connected to the tank guides, forming one straight vertical guide to the tank and standard.

*Inlet and Outlet Pipes* will be supplied and fixed by the company.

*Blow-Off Cocks* are to be fitted in the manholes—one with a pipe to the bottom of the inner lift, with 1-in. cocks and tubing.

### Outer Lift.

*Cup.*—For the inner lift, bent plate 15 in. deep by 6 in. wide inside, of No. 5 B.W.G., riveted to the curb with a bead 1¼ in. and ½ in. round, riveted on the upper edge by countersunk rivets.

*Grip and Side Sheets* of No. 5 B.W.G., bent as shown, with bead, &c. The second row and the bottom row of No. 12 B.W.G.; the remainder of No. 15 B.W.G.

*Vertical Stays.*—Sixteen vertical stays of 5 in. by 2½ in. by ⅝ C iron inside for the cup rollers of the inner lift.

*Grip Rollers.*—Eight grip rollers shall be taken from the bottom curb of the inner lift, and new carriages provided.

*Bottom Rollers.*—Sixteen bottom rollers shall be provided, 6 in. diameter by 3 in. wide, with axles 1 in. diameter.

*Bottom Curb.*—This shall be of two angle-irons 3 in. by 3 in. by ¾ in. ⌋, 10 in. apart, to which the bottom rollers will be bolted.

*Girders.*—As for the inner lift, only 1 ft. 4 in. deep.

### *Discussion.*

Mr. Salmon asked if Mr. Featherstone had experienced much difficulty, or if he had found the necessity, for a third pipe entering the gasholder. Very often such a pipe was put in which, in the event of one being stopped, could be made either an inlet or an outlet pipe.

Mr. Featherstone said he had had the curious experience, at Dundalk, of having only one pipe for both inlet and outlet. He had no difficulty at all with it beyond this, that at night, when the gas first came through, it was apt to blow. But the best plan he had seen was to put the pipes in one on either side of the holder, so as to mix the gas, because they were aware that, if they were selling more than was being made, if the pipes were near each other, the gas was apt to run from the one to the other. He never knew of an inlet-pipe being stopped altogether, unless it was where the foul main was faulty, where it might be hot in one place, and then be exposed to a keen, cutting draught, as, for instance, between two houses.

The President said he thought he should only be voicing the opinion of the members if he conveyed the heartiest thanks of the meeting to Mr. Featherstone for his very lucid description of a 50-feet gasholder. He was very pleased to find that he condescended, as he would like to express it, with his large experience of holders containing millions of cubic feet of gas, to select an example that would perhaps be of future use to the members, and he was strongly tempted to think that, whenever they required additional extension in holder accommodation, one of their first acts would be to refer to the fuller description of this holder which would appear in their report.

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Mr. P. Hurll (Glasgow) then read the following paper:—

### On the Manufacture of Fire-Clay Gas-Retorts, and the Advantages of having Standard Sizes.

When your esteemed Secretary, Mr. Whimster, asked me to read a paper at your present meeting, I naturally selected the subject with which I am most conversant; and I trust the few remarks I am about to make, in reference to the manufacture of fire-clay gas-retorts, and the advantages of having standard sizes, will be acceptable to the members of the Association.

My whole business life has been connected with the fire-clay trade; and since the year 1857 till the present time, I have been engaged in the manufacture of fire-clay goods. In 1857, when I joined my father's business, iron retorts were still much used. At that period, there were two Gas Companies in Glasgow—the Glasgow Gas Company, and the City and Suburban Gas Company. The latter Company's works were at Dalmarnock; and the former Company had stations at Townhead, Tradeston, and Partick. Mr. Ritchie, the Manager of the Glasgow Gas Company, used fire-clay retorts at all three stations; but Mr. Bartholomew, the Manager of the City and Suburban Gas Company, used only iron retorts, and continued to do so until the works passed into the hands of the Glasgow Corporation, and under the management of Mr. Foulis, who very soon substituted fire-clay retorts for the iron ones at the Dalmarnock station. Since that time, fire-clay retorts have driven iron ones from the field; and it is an exceptional thing to see iron retorts used for the manufacture of coal gas, except in small private works, where the retort is only occasionally heated up.

Some people are under the impression that fire-clay is a soft material, such as the clay used in the manufacture of common or building bricks, but this is not so. It is a very hard mineral, and is worked from a pit or shaft the same as coal, at considerable depths, varying in my district from 120 to 300 feet. Fire-clay is mined by boring and blasting with gunpowder; and

you have here a sample of the fire-clay as it comes from the mine. When exposed to the weather for a considerable time, it disintegrates and becomes much easier to mill.

The fire-clay is ground in a pan mill, under two cast-iron rollers, 4 ft. 6 in. diameter by 12 broad on the face, weighing each about 4 tons. This pan is fitted with perforated gratings. The fire-clay, when ground, falls through the gratings into a pit, where a set of elevator buckets on an endless belt carry it up, and throw it into a circular sieve, about 3 feet diameter by 9 feet long. The fire-clay which passes through this sieve falls into a hopper supplying the wet or tempering mills; and the rough pieces which will not pass through are returned to the mill for re-grinding. This sifted fire-clay is run by shoots into the wet or tempering mills, and there mixed with water and a certain proportion of crushed burned clay. It is ground to a proper consistency for the description of goods it is intended for, placed in a boggie, and run to where it is to be used. All fire-clay retorts made in Scotland are built by hand; no machine-made retorts being manufactured. One of our largest gas-works some years ago used a large number of machine-made retorts; but they did not give satisfaction, and the experiment was not repeated.

When the prepared fire-clay is delivered to the retort-builder, he first beats out the bottom of his retort the exact shape of the body; and he then places on it his retort drum, and begins to build. The clay is formed into small rolls by his boy; and he builds round the drum, and for the thickness of the body he uses his frame. I have here a drum and frame used in building the Glasgow Corporation Gas-Works retorts. After the retort-builder has built about 4 feet, he coats the inside and outside of the retort with very fine ground clay, mixed with water to form "slurrey," and polishes with a steel tool. There are usually 80 to 150 retorts on the stove-floor; and the builder goes over them in rotation, building a small quantity at a time. This continues from day to day until the retort is up the height where the mouthpiece is formed. He has another frame for the mouthpiece, showing the position of the bolt-holes; and he either contracts or expands the mouth, to suit the template.

The retorts are allowed to dry; and are then transferred to the kiln or oven, where they are slowly fired for 48 to 60 hours —the heat being very gradually raised until the kiln is in full fire, when another period of firing at high heat is continued for 48 to 60 hours, until the retorts are sufficiently hard burned. This is ascertained by trials withdrawn from the kiln at different parts of the process. The tools required in building are principally a spirit-level and plumb-line, steel scrapers, knives, and some polishers.

Makers are very conservative with regard to the material used in building gas-retorts. If the fire-clay is found suitable for retorts, they do not care to experiment with it. They have no means of testing by actual results, and are afraid consumers may complain as to the variation of quality. I am of opinion that the users of retorts should make suggestions as to new materials or methods of treatment; or if a manager would allow the makers to supply retorts for trial and experiment, it would encourage the manufacturers to try variations in the mixture of fire-clay with other material, so as to produce retorts tougher and more elastic, and not liable to crack, also enamels or glazes to prevent carbon adhering to the retorts.

For many years I made retorts for one of the largest companies in Scotland; and the manager's instructions were to mix with the fire-clay a certain proportion of a very fine and plastic yellow clay. He assured me that the retorts so made were tougher, had a longer life, and were not so short as those made from pure fire-clay. I have also salt-glazed retorts all over inside and out; and enamelled them inside only, to prevent carbon adhering. But in actual working, the enamel soon wears off, owing to friction in charging and drawing. I have lately made a number of retorts 4 inches thick in the body, and enamelled inside, for making oil gas by the Peebles process; but they are not yet working, and I cannot say whether or not the result will be satisfactory. I fain hope it will be.

I now pass on to the question of standard sizes. Before I left Scotland, I asked my works' manager to furnish me with a list of the various sizes of retorts made at my works. I find there are 44 sizes of ⌂ retorts, varying from 13 in. by 11 in. to 30 in. by 15 in.; 12 sizes of oval retorts, varying from 16 in. by 14 in. to 24 in. by 15 in.; 7 sizes of round retorts, from 12 in. to 18 in. diameter. For these 63 sizes of retorts, I have 140 different mouthpieces; the bolt-holes being all different, and the slots of three different sorts—T, screwing into nut, and bat-bolts.

You will understand that there is some difficulty in keeping a correct record of the various mouthpieces, templates, and descriptions of slots; and if there is any change in the retort builders, it requires continual care to keep them right. There is also the question of the position of the bolt-holes. No doubt you have often found that the holes do not come in exactly to suit your cast-iron mouthpieces. In building retorts, there must be an allowance of § inch per foot every way for shrinkage from the green to the burned state. Thus a retort 24 in. by 18 in. inside must be made 25¾ in. by 19 in.; and in addition there is the shrinkage on mouthpieces 5 inches thick. The builder may cut his bolt-holes exactly to template. But there may be a difference in the nature of the fire-clay he is using or in the burning; and when the retorts come from the kiln the bolt-holes do not fit the mouthpiece.

At the present time, retort building is a season trade, extending for seven months—say, from February to August; and there is great pressure for deliveries, especially in June and July. I hold that, if standard sizes were adopted, the business could be carried on all the year round, and the retorts be stocked until such time as they would be required. A manager could then, in case of a breakdown, get a retort at any time, without waiting until his own special size was made. The manufacturer also could go on making steadily all the year round, and give all retorts built his careful attention; whereas at present in the busy part of the season, the work is pushed on as quickly as possible. No maker at present cares to make retorts for stock, as all sizes are special; and although he may hold the order for a gas-works this season, there is no guarantee that he may have the same order next season. It would also be an advantage to the iron founder, as mouthpieces would be the same all over; and these could be held in stock the same as retorts, and supplied as required. I do not say there should be only one size of retort for large and small works; but three or four sizes could be selected, and the lengths made in 3-inch sizes, beginning at 8 feet and running to 9 feet or even 10 feet.

It would be a great advantage to gas-works managers and retort-makers, if some of the Gas Managers' Associations would take up this matter; and I do not see why your Association should not lead the way.

*Discussion.*

Mr. FEATHERSTONE asked if there was any reason for retorts being made 9 feet long.

Mr. HURLL replied that there was not, and he was making for Middlesbrough inclined retorts which were 10 ft. 8 in. long. They could make them of any length they pleased.

Mr. WHIMSTER: How does the clay stand a height of 10 feet without bulging?

Mr. HURLL: It is built up gradually. There are flues underneath the place where the retort is standing; and we fire up these, and dry the retort as we go along.

Mr. G. R. LOVE (Dundalk) thought the paper had been very interesting. He was much struck with a number of propositions Mr. Hurll had brought forward. He hinted that gas managers should make suggestions to him; but he did not say anything about the cost of a retort for working out improvements which would bring large returns to the coffers of Mr. Hurll and other makers. He (Mr. Love) thought the brick makers generally had the experience of the gas managers in the usual way. Mr. Hurll tried to get at a state of perfection. This was hardly possible, because they had all so many ideas as to the length and the size of their retorts; they were all subject to local conditions. It was not everyone who had the opportunity of taking down a whole bench, and putting up a standard size; they had just to work with the retorts they had. But certainly it would be a great advantage to the builder if a standard size were adopted. He did not say whether or not this would reduce the price of the retort; but he (Mr. Love) thought it should. Certainly it would prevent such mistakes as their friend of Portadown had in getting the retorts of somebody in Scotland; and somebody in Scotland getting his. There was one disadvantage in ordering their retorts in the spring, which was that they might not be properly fired. The rush and the push might cause scamping work on the part of the man who was making them, or in the firing. It would certainly be an advantage if they could have a guarantee as to their make and their lasting capacity, as was proposed for meters.

Mr. WHIMSTER remarked that there were one or two things of which he would like to take notice. The paper had been a most interesting one. Standard sizes was a very difficult subject. There was no mistake that, if they could have standard sizes, it would suit everyone all round; but it just occurred to him whether the makers of fire-clay retorts were not to blame for the legion of sizes that existed. Gas-works had been put up gradually. If the makers had just kept to their standard sizes, and sent them in, the benches would have had to be built for those sizes. But now the arches were built; and a manager went into a place—just as he did in Armagh, where he found, he thought, seven sizes of retorts. He had had them reduced, since he came, to, he thought, only four sizes, or perhaps only three; and he considered that if makers would get into the way of keeping only standard sizes—say, 24 in. by 15 in. or 24 in. by 18 in.—and offering them at a certain price per foot, with the condition that, if special sizes were required, they must be paid for so much extra, they would soon drive special sizes out of the market, and everyone putting up a new retort-bench would see that he built it for standard sizes. He thought, therefore, that the standardizing of retorts lay in the hands of the makers, and not in those of the gas managers. Mr. Hurll said that he had been experimenting, to some small extent, with retorts; but that he did not care about doing this, because managers would not let him. He (Mr. Whimster) believed that it was just the other way about; and that if managers knew that the makers were willing to experiment, they would be pleased to allow them. He could understand that a maker could hardly try at such a place as Glasgow, because some 400 retorts might go wrong; but if he were to come to anyone like himself or Mr. Salmon, he, for one, would do his best to make the thing a success. He would be very glad to let the makers try a new retort side by side with

the old ones, and see how it would stand the variations of temperature. He had often thought they could enamel the inside of retorts to prevent incrustation with carbon. If they had some means of doing this, he was sure all managers would be glad to let them try it on their next order for retorts.

Mr. SALMON asked if, in the making of hand retorts, they could bring them down or increase them in size. The mouthpiece represented something like £2 to £3 10s.; and this was a great matter, because directors might inquire why they could not get retorts at the same price they did years ago. He asked Mr. Hurll if he had had any experience in the making of a vertical retort for oil gas.

Mr. HURLL replied that he had not. He had, however, made certain retorts lately for oil gas. They were about an inch thicker than ordinary retorts, and were enamelled inside. He questioned if, though they enamelled retorts, the enamelling would not crack. That was the difficulty. If the enamel cracked, and the oil circulated through the retort, he was afraid there would not be much chance of the retort standing. With regard to mouthpieces, he might just tell Mr. Salmon that, when Mr. Mitchell went to Edinburgh, he found only round retorts, about 12 inches diameter. He was in the position of having hundreds of round mouthpieces in stock; and he asked them to make oval retorts, and put round mouthpieces upon them. They had made round retorts, and put on ⌂ mouthpieces; and they looked very ugly. He could tell them how he made a mess of an order for retorts. For regenerative purposes, 21 in. by 15 in. was the usual size of retorts. Mr. MacPherson, of Kirkcaldy, telegraphed to him once to send on twelve short pieces to repair some which had become worn where the air cut in. He was at the time making retorts the exact size for the Glasgow Corporation. It never struck him about the bolt-holes; and so he sent these retorts to Kirkcaldy. When Mr. MacPherson tried his template on to the mouthpiece, the bolt-holes were all wrong; and to cut new holes would have weakened the plate. He therefore had to pay the carriage of the retorts to Kirkcaldy and back; and this was all he obtained out of the transaction. Mr. Love had spoken of his supplying experimental retorts. He thought it would be quite a fair thing if they were to "split" the matter between them. He had made many experiments. He remembered Mr. Beilby—the joint patentee with Mr. Young of the oil-retorts—had an idea that fire-bricks mixed with a proportion of sawdust would be a good thing, as a sort of non-conductor. They made some bricks in this way; but when they burned them, the sawdust was entirely consumed, and the bricks were left like pieces of sponge, and were unsuitable for the purpose intended.

Mr. JONAS DRAKE (Ovenden, Halifax), as an outsider, wished to be permitted to say that he dealt with some thousands of retorts in the course of a year; but he had to learn, for the first time, Mr. Whimster's theory that the supply should regulate the demand. He thought charity should begin at home. There had been no word spoken yet as to the size of retorts. He had been led to understand that the standard was 21 in. by 15 in. for small and medium-sized works, and 22 in. by 15 in. for large works. He believed in a round-cornered ⌂; but the question was as to the length. He should have it 21 in. by 15 in., and make a difference in the producing power in the length—increasing the retorts from 6 to 10 feet. Some years ago, in a place where they had 15 or 16 inch round retorts which were sufficiently wrought out, they put in 21 in. by 15 in. retorts, because the mouthpieces were not worn out. There were formerly eight round retorts in one bed; and there were now six 21 in. by 15 in. There were two retorts less; but there was more retort power. This was a matter which should not be lost sight of by gas managers in looking to the question of pounds, shillings, and pence. The small retorts, at £2 each, came to £16; the other retorts ran to £13 10s.—making a saving of £2 10s. per bed, which was a consideration. With regard to backings in the retorts, he did not know what Mr. Hurll's idea was, but he (Mr. Drake) believed in having a clear road through. Making them with backs was a good reason for the deposition of carbon; and then the backing of the retort cracked. In all his specifications, he laid it down that the retorts should be left open at the back. There was the question also of retort-bolts. He thought, having had upwards of thirty years' experience in this matter, that box-bolts should be used in every case. He believed they were much superior to T-bolts. He thought that 21 in. by 15 in. was the smallest size of retort they could get a man into for repairs; and this was a first consideration which should be given to sizes.

The PRESIDENT said they had had a very interesting paper by Mr. Hurll; and it had afforded him personally considerable information. There were one or two paragraphs in it which explained a certain amount of inaccuracy which occurred in his own last consignment of retorts—viz., the amount of shrinkage. They sent over a template with the usual projections corresponding to the bolt-holes; and on the arrival of the retorts, they found that fresh holes had to be drilled in the mouthpieces. The contraction of $\frac{3}{8}$ inch, he thought, would account for this. There was one item which he considered of great value, and that was the possibility of enamelling or glazing retorts. If Mr. Hurll could produce a glaze which would prevent carbon adhering to the interior of the retorts, he (the President) might say he would earn the gratitude of every gas manager, because it was a great annoyance to have to stop producing gas, and frequently in the depth of winter, when, in view of the desired make, they could ill-afford to do it. He thought that more uniformity in retort-settings would be a considerable advantage; and it occurred to him, while the paper was being read, whether a description of a standard retort-setting for five or six retorts might not tend in future to greater uniformity of dimensions. Of course, as the make of gas at their works increased, they endeavoured to squeeze into the same bench a larger retort; and this probably had tended to the employment of intermediate sizes. One remark by the last speaker was of much importance—namely, the possibility of increasing their output by increasing the length of the retorts. It never occurred to him before. Up to the present, the general practice had been to enlarge the diameter, or the breadth, as the case might be; but if they were to increase their bench without pulling down the altered portion, they would by this means have an increased making capacity. He thought the members were greatly indebted to Mr. Hurll for his paper.

Mr. HURLL said, with reference to Mr. Drake's remarks about having no backings in the retorts, he could give them some information in regard to Scotch usage as to through-and-through retorts. When the gas-works of the Greenock Corporation at Inchgreen were built, Mr. Stewart, the Gas Manager, ordered through-and-through retorts; but he found that with Scotch cannel coal he could not get the required amount of work. If the men at one side clapped to a retort-door, the men on the other side could not get within yards of it, so much flame came out. So that it did not appear that through-and-through retorts were suitable for Scotch cannel. If they were to have oil gas for enriching, they would be able to use splint coal; and then it might be possible to use these retorts. He had only to thank the members for listening so closely to his remarks; and if at any future time he could bring up a paper on retort-settings—this would, however, be more in Mr. Drake's line than his—he would be very pleased to do it.

Mr. DRAKE explained that his remarks referred to making a retort through, and not to through-and-through retorts.

The discussion on "Experiences in Purification" will be given next week.

## THE GAS INDUSTRY IN THE UNITED STATES.

**By Herr W. von Oechelhaeuser, of Dessau,**
General Director of the German Continental Gas Company.

**A Lecture delivered at the Meeting of the German Association of Gas and Water Engineers at Carlsruhe, June, 1894.**

(*Continued from p.* 378.)

### III.—AMERICAN GAS-WORKS AS CENTRAL STATIONS FOR THE SUPPLY OF MOTIVE POWER.

Having examined the condition of American gas-works as central stations for heat and light, we may now pass on to the consideration of those works as central sources of power. In this respect Dr. Bunte and I were quite as much disappointed in America as we had been in regard to the Auer burners; nay, whereas we in Germany are only about two years ahead of the Americans as regards these burners, America may be said to be nearly a decade behind us in respect of the development, profitable working, and general utilization of gas-engines. In a paper on "Gas-Engines in the United States," read by Mr. H. Shelton, Engineer of the Gas Improvement Company of Philadelphia, before the Western Gas Association at Chicago, in 1893,* the reasons which account for this anomaly are fully set forth; so that I need only add a very few words on this topic. He first proves by statistical data, collected by direct inquiry, that one gas-engine is used, on an average, for every 7500 persons,† while in Germany, from the very careful investigation made by Herr Schaefer,‡ it appears that one gas-engine existed in 1892 for every 940, or, taking it in round figures, every 900 inhabitants. Thus it will be seen that the employment of gas-engines with us is, comparatively speaking, eight times greater than it is in America.

The number of gas-engine builders is set down by Mr. Shelton as "twenty at least;" while in Germany, which is so much smaller than the American Union, the number of gas-engine manufacturers is from sixty to seventy—*i.e.*, is over three times greater—even Herr Krupp having recently become one of them. The "Otto" gas-engine, as constructed by the firm of Schleicher and Schumm, of Philadelphia, still occupies the first rank in America. As to the manufactures of other firms, differing from that type of engine, I need not pause to consider them here, but may refer the reader to the reports published on the subject in the *Journal of the Association of German Engineers* by Schöttler (1891, p. 963) and Freytag (1893, p. 1227), and also to the paper of Mr. Shelton. The main cause of the remarkably restricted use of gas-engines in the States is generally supposed to be the disproportionately high price of gas-engines in comparison with the price of steam-engines, which, it must be confessed, is unusually low in

* See JOURNAL, Vol. LXII., pp. 937, 994.

† Sixty towns, varying in their population between 8000 and 555,000, and representing altogether a population of 4,000,000 inhabitants, were using 540 gas-engines in all.

‡ See "Power Supply in German Cities by Lighting Gas," by Franz Schaefer, in the *Journal für Gasbeleuchtung*, Nos. 16-19, 1894; also in book form, published by R. Oldenbourg.

America. In Germany, gas-engines are in all cases, almost without exception, cheaper than steam-engines, especially when the cost of the boilers is taken into account; whereas in America the difference is the other way—gas-engines being from two to four times more expensive.

Just as Montreal was the only city in which I found the new Auer-burner being energetically pushed, so San Francisco, on the Pacific Ocean, and in the extreme Far West, was the only place where—mainly owing to the energetic efforts of the President of the San Francisco Gaslight Company (Mr. J. B. Crockett), and to the existence of works in San Francisco in which the construction of cheap gas-engines is a kind of speciality—the employment of gas-engines is almost as general as in Germany. The prices of gas, as supplied for motor engines, fluctuate, as with us, between 12 pf. and 15 pf. per cubic metre (3s. 4d. to 4s. 4d. per 1000 cubic feet); while the motors themselves, in America as well as in Germany, generally do their work at less cost than electro-motors.

The recognition of the fact that gas-engines in America, as much as anywhere else, are destined to play an important part in the future, seems, however, to be shared in by all the authorities whom I had the opportunity of meeting; and a significant circumstance in connection with this question is that at the present time even the well-known dynamo-works of Westinghouse, at Pittsburg, are taking up with great energy the construction of gas-engines. The vertical gas-engines, which they build in a style very similar to their twin "hammer" steam-engines, may be coupled with the dynamo direct; the management taking the perfectly correct view that, in a great many cases, it is hardly possible to fit up an electrical station more simply than by providing gas-driven dynamos, especially where space is an object, as it generally is in the busy parts of American cities, with their tower buildings.

The employment of gas-engines in propelling street cars has been tried in America as well as in England and with us. Thus, in a northern suburb of Chicago, I came across a locomotive engine driven by gas, and constructed on the well-known Connelly system, which has been repeatedly described in technical journals. The engine, with a car coupled to it, was being run by way of trial for the distance of about a mile. The engine had originally been constructed to be worked by naphtha; but at the time I saw it, it was being fed with oil gas (not coal gas), because there happened to be an old oil-gas works at the Company's disposal, so that the better and cheaper plan was for them to make their own oil gas instead of purchasing coal gas. The particular gas-driven car that was being worked at the time did not, indeed, give entire satisfaction; but the contemplated improvements, which were then being devised by Mr. Lynch, seemed to promise a fair measure of success for it in the future, as also for this system of independent locomotive engines driven by gas. What the Street Car Company, who have bought the Connelly patents for the State of Illinois (being styled the Connelly Motor Company of Illinois) contemplate doing after the improvements have been successful, is to replace the existing tramcars by gas-driven cars upon the so-called "feeders"—*i.e.*, the lines radiating from the outskirts to the busy centre of the town. This is a very rational plan, and one that goes to show that cars driven by gas-engines may be combined or made to co-operate with cables and tram-lines or trolleys. A further outlook is to introduce gas-driven cars into smaller towns in which the sparseness of the population did not warrant the employment of electrically-operated or horse-drawn cars.

A feature of American street life most interesting to observe is to see, side by side, tramcars drawn by horses, moved by cables, and driven by electricity or steam. But, notwithstanding the great success which the so-called trolley system has undoubtedly met with hitherto in America, the latest street-car line opened in the City of New York while I was staying there was a cable line; and this system also predominates in Chicago—absorbing the greater part of the traffic of the city. What accounts for this condition of things is the fact that the grave inconveniences resulting from numerous overhead lines had not then been long obviated in New York. It must at the same time be admitted, however, that the cable method of locomotion has not, any more than the other existing means of conveyance, so far proved capable of quite satisfactorily coping with the dense traffic; and, in order to show that none of the street-car arrangements now existing in America appear to be sufficient to the most eminent and authorized persons, engineers or official authorities,* I would here like to quote a few passages from a most interesting letter addressed by the Metropolitan Traction Company—*i.e.*, the Company that runs the New York street cars—to the Board of Railroad Commissioners, and published in the issue of the New York *World* for the 15th of December last. After having stated that the cable system recently fitted up is chiefly suitable to apply to straight lines, the letter proceeds as follows:—

The sole question is: What motive power can here besu bstituted, to mutual advantage and satisfaction? We desire to hasten the development and completion of such an improved system by the offer of an immediate reward which would encourage such a concentration of energy as to bring about quick results. We therefore submit to you the following propositions: (1) We will set aside the sum of $500,000, to be awarded as a prize to any person who shall, before March, 1894, submit to your honourable Board a system of motive power for street railway cars, demonstrated to be superior or equal to the overhead trolley. (2) The qualities necessary to meet this requirement shall be left to your decision. But, with the present state of the art, a system, to win an award, must necessarily approximate to the trolley system—*i.e.*, the electrical railway with an overhead supply of current—as a standard of economy of operation, but should be without the features thereof objectionable to the public.

Gentlemen, I am not aware whether it was possible for the Connelly Gas Motor Company to take part in this competition prior to March of this year. Indeed, I do not know whether that competition has taken place; but, judging from the general requirements, as stated by the Metropolitan Traction Company in the letter offering the prize, it seems quite possible that a gas motor system may be one of the many systems by which the problem can be solved. Such, too, was probably the view of my courteous American colleague Mr. Egner, who very kindly sent me the newspaper cutting in which the letter offering the award was quoted. The possible solution may lie either in the direction of the construction of a separate locomotive engine, driven by gas, with the carriages attached to it, on the Connelly system; or it may assume the form of a motor engine directly joined to the passenger vehicle, on the Lührig system of Dresden, which the London Gas Traction Company have carried out with many improvements.* This system of the London Company, to my mind, shows that Germany and England are, in this respect, in advance of America. It is to be hoped that the first public gas tramcar service established at Dessau this year, with nine gas-motor cars to cover two lines for a distance of 4·4 kilometres, may not be a failure.†

Be this as it may, and no matter which of the existing or future gas-car systems may be adopted in preference, both the judgment of many intelligent American engineers and the letter partly quoted above warrant the conclusion that, among the many methods of operation which will have to be called into requisition to supply the growing want for street-car accommodation, the gas-motor system is sure to have its place assigned to it, both in America and in Germany. This system, indeed, combines, in an almost ideal manner, all the advantages characteristic of both centralization and decentralization, since, in fact, the production of the driving medium on a large scale is centralized in the existing gas-works and pipes, whereas their actual operation of the driving power so produced is decentralized, somewhat in the manner which constitutes the ideal of many electricians; each car being provided with a light power reservoir or accumulator, which may, in various parts of the town, or at certain points on the line, be refilled, according to requirements, with fresh supplies of the driving medium, so that each car, or its engine, may conveniently be operated without having to depend on wires or cables for its supply of motive power. Besides—and this is a most important feature in street-car traffic—the gas-motor cars are remarkably light. The small cars of the Dresden system, for example, at Dessau, which hold 20 persons, only weigh 4½ tons. On being once charged with gas, each car will run for about 8 kilometres without requiring to be refilled.

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With this I will conclude the series of my "instantaneous pictures," by which I have endeavoured to illustrate the present state of the gas industry in America in regard to the distribution of heat, light, and power. In reviewing these sketches, I ask you to bear in mind the fact that the development of American industry, in this as in other departments, has taken place under conditions peculiarly and essentially American, which we must not, without further notice, attempt to compare with the conditions of our industrial life at home. Therefore, while the Americans are indeed "behind the age," as regards the employment of the greatest invention in gas lighting of modern times—*i.e.*, Auer's new incandescent lamp—and also in the general adoption of gas-engines, and while we Germans have made more progress than our American friends in the manufacture of coal gas, especially in our methods of working generator furnaces,‡ we have, on the other hand, all the more reason to thank them for having thus far worked out water-gas manufacture, and done for us so much of the preliminary work in this direction, and with such really splendid results; thereby enabling us, almost without any risk, to embark in the production of this gas at any convenient time—*i.e.*, whenever the carburetting agents available, or the improvements made in the incandescent burners, may permit us to do so—and to compare, or to combine, if we choose, American methods of operation with such European methods as may have been devised for its manufacture. The service they have rendered us in this respect cannot be over-estimated when it is considered how rapidly things advance and mature in these go-ahead times.

*(To be continued.)*

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* Compare Riedler's "Light and Power Plants in Boston," which appeared n the *Journal of the Association of German Engineers* for 1893.

* An account of the application of this system to the cars on the Croydon and Thornton Heath Tramway appeared in the JOURNAL for June 26 last, p. 1233.—ED. J.G.L.

† See the lecture by Herr Kemper, delivered at the Dresden meeting last year, published in the *Journal für Gasbeleuchtung* for 1893, p. 505 [see JOURNAL, Vol. LXIII., p. 152]; also the essay entitled "Some New Results of the Tentative System of Gas Motor Cars started by the Gas Traction Company," published in the *Zeitschrift für Kleinbahnen* for 1894, No. 5.

‡ I only found one system of generator furnaces in use—Klönne's—and this had been imported from Germany.

## CORRESPONDENCE.

*[We are not responsible for the opinions expressed by correspondents.]*

### The Main Improved Atmospheric Gas-Burner.

SIR,—We observe that Mr. Fletcher has again rushed into print with his usual condemnation of a rival maker's goods. So much was to be expected. He presumes to enlighten your readers as to the merits of a newly patented burner which he has neither seen nor handled, and regarding which he is not, therefore, in a position to pronounce an opinion. We certainly think it would have been more decorous on Mr. Fletcher's part to have first seen and tested our new burner before writing you.

We are perfectly familiar with the burner brought out by him in 1886, and which, he admits, proved a failure. Our newly patented burner is, of course, constructed on entirely different lines. Mr. Fletcher has given his experience; we are entitled to relate ours. This burner could have been placed on the market last winter; but we purposely kept it back in order to make the most exhaustive tests of its efficiency under all conditions of working. We have had this new fire burning constantly for between eight and nine months, for ten to fifteen hours daily; and during this period it has done as much work as the average householder would require of it in two or three years. No deterioration has taken place in the gauzes; no dust has collected; no firing-back has occurred. This confirms the great value of our patent. You have been shown, Mr. Editor, the gauze removed from this fire, and you are in a position to judge of its condition. We quite admit that our claims regarding this invention are great. Hence our precautions in giving it the exhaustive trial we have done before putting it upon the market.

If Mr. Fletcher is prepared to prove to any Committee of the Gas Institute that the failures he has met with apply to our invention, we are, on our part, prepared to pay over one hundred guineas (£105) to the Benevolent Fund of the Institute. As Mr. Fletcher has gone out of his way to make the charge, we require that he would be willing to forfeit a like amount to the same fund provided he does not substantiate his assertions.

Any gas engineer can easily test the matter for himself.

*Glasgow, Aug.* 22, 1894. R. AND A. MAIN.

### The Construction of Gasholder Cups and Grips.

SIR,—In your issue of Aug. 21, you find fault with a paragraph in my paper read before the North of Ireland Gas Managers' Association, which attributes to Mr. H. O'Connor the invention of what I believe to be an entirely novel form of cup. Had you, before writing this notice, examined the drawing accompanying the paper, whereon is shown the pattern of cup proposed, you would have seen that the arrangement which was suggested primarily as a means of adapting a curved plate cup to a holder which had already an angle-iron affixed as a bottom curb, was (I think you will agree) a new departure. That Piggott, of Birmingham, was the originator of the bent plate cups and grips, I am perfectly aware; and this was pointed out in my paper, and in the discussion which followed the reading of it. The gasholder treated upon in my paper was one which was prepared for the addition of a second lift; and, to avoid the first cost of fixing a cup to the future inner lift, an angle-iron curb is affixed, which is afterwards to be utilized for the attachment of a bent plate of novel form. The advantage I claimed for it, besides the above, was that any dirt must necessarily gravitate to that part from which it could be easiest removed.

*Beckton, Aug.* 22, 1894. W. B. FEATHERSTONE.

### Gas-Lights in Bedrooms.

SIR,—One of the "wise ones" states in a popular periodical that "a burning gas-jet is unhealthy in a bed chamber because one gas-light gives out as much carbonic acid gas as two sleepers." This may be true with a large burner, full on, in an unventilated room without a chimney; but the same burner turned down to a consumption of one-fifth of a cubic foot per hour, affords as much light as an ordinary night-light and gives off only one-twelfth as much carbonic acid as an ordinary sleeper—an amount less than one-fifth of the difference between two individuals, and less than could be detected by ordinary analysis. If the percentage of carbonic acid is very important, the gas may be ignored. The proper thing is to select your "sleeper," because a quiet sleeper exhales less carbonic acid than a restless one. The wise ones who write on technical matters in the popular press can sometimes be amusing without an effort.

*Warrington, Aug.* 24, 1894. THOS. FLETCHER.

## PARLIAMENTARY INTELLIGENCE.

### THE FINAL STAGES OF THE GAS AND WATER BILLS.

Last Saturday, the session was brought to a close; and Parliament was prorogued by Royal Commission to the 10th of November. After our last report (*ante*, p. 335), the following Bills passed their final stages: Cardiff Corporation Bill, Colne Valley and Central Middlesex Water Companies' Bill, Consett Water Bill, East London Water Bill, Harrow and Stanmore Gas Bill, London County Council (General Powers) Bill, Plymouth and Stonehouse Gas Bill, Preston Gas Bill, Southwark and Vauxhall Water Bill, Swindon Water Bill, Thames Conservancy Bill, West Middlesex Water Bill.

**Ottoman Gas Company, Limited.**—The Directors of this Company report that the gas-rental for the half year ending June 30 amounts to £8429; and the net profit, to £3253. The amount standing to the credit of profit and loss account is £3651, which the Directors recommend should be dealt with as follows: £500 to be transferred to the reserve fund; £2625 to be distributed as dividends, at the rate of 7 per cent. per annum on both classes of shares; and the balance of £526 to be carried forward.

## MISCELLANEOUS NEWS.

### LIVERPOOL UNITED GASLIGHT COMPANY.

The Annual Meeting of this Company was held on Tuesday last—Mr. E. LAWRENCE presiding.

The SECRETARY (Mr. P. F. Garnett) read the report, which stated that the total revenue for the year ending June 30 last was £616,930; and the expenditure, £509,140—leaving a surplus of £107,790, which had been transferred to the credit of profit and loss. After deducting the amount required for the dividend declared last February, and the interest on the bond and debenture debt, there remained a balance of £44,138. The Directors recommended the payment of a dividend for the past half year of 5 per cent. on the ordinary consolidated "A" stock, and of 3½ per cent. on the 7 per cent. "B" stock. For the payment of these dividends, it would be necessary to draw on the reserve fund to the extent of £6245. The Directors also had pleasure in announcing that the prospects of the Company for the current year justified a reduction in the price of gas to 3s. per 1000 cubic feet, to take effect from the end of last quarter.

The CHAIRMAN, in moving the adoption of the report, remarked that, when the shareholders bore in mind all that had taken place within the last twelve months, he thought they would come to the conclusion that the report was anything but unsatisfactory. He confessed that last year, after the outbreak of the coal strike, he did not look forward to anything like such a result of the twelve months' working; but he hoped that both the proprietors and the public would feel that their interests had been looked after faithfully and carefully. Turning to the revenue account, he said that the principal item for comment on the expenditure side was the amount paid for the material carbonized, which was £316,853, against £294,154, or £22,700 more than in the previous year. For this, the shareholders would be prepared; but he would remind them that this sum did not in any way convey an idea of what the coal strike cost the Company. When they commenced the year 1893-4, they were beginning to work upon the reduced cost of material; and if they had had coal delivered to them during the whole of the year at the contract price, the result would have been very different. As a matter of fact, they had actually spent, in round figures, £44,000 more for coal and cannel than they expected when they started the year. This was really a measure of the increased expenditure entailed upon the Company by the coal strike of last year, so far as the amount paid for material was concerned. While some of the items of expenditure showed a small increase and others a diminution, the result was that, apart from coal, there was a decrease of £5085 in the outlay; thereby making the total increase on the expenditure side £17,694. Regarding the receipts, the gas sold to the general public showed an increase of £16,403. This, however, included six months when the price was 3s. 4d. per 1000 cubic feet, against 3s. in the preceding year. If they had consumed the same amount of gas during that period as in previous years, the extra 4d. ought to have produced £24,000 instead of £16,403. This had come about from four causes—competition with the electric light, bad times, brighter weather, and the increase in the price of gas. It would be satisfactory to know that it was not from electric light competition that they had suffered most seriously. Of course, they were constantly finding that some large works in the town were resorting to the use of electricity; but for this they must be prepared. The amount, however, that had been lost from changes of this kind during the year was comparatively small, and was not of a character to give anxiety to the Company. A similar remark applied to the deficiency arising from each of the other three causes. In regard to residual products, they found, as a natural result of the coal strike, an increase in the amount received for coke of £13,386, which was a certain set-off against the increased price paid for coal. On tar there was a deficiency of £7618 through having to keep to the lower scale of prices; while on sulphate of ammonia there had been an increase of £8193, which arose from the steady increase that had taken place in the price of sulphate, on which their contracts were based. The total result was that the receipts amounted to £616,930; and the expenditure to £509,140—showing a balance to the credit of the Company of £107,790. Out of this, they had to pay £13,268 for interest on the bonded debt; and the statutory dividends for the half year amounted to £100,767—making a total of £114,035, or £6245 more than the net profits of the year. This last amount they took out of the reserve fund. Coming to the question of the future, perhaps they would say, "How are you able to reduce the price of gas?" He would explain that in a very few words. The prices of material for this year would, of course, be comparatively low, because they were now getting the benefit of the cheap contracts made last year and not supplied, the consequence of which was that the price to be paid for coal and cannel during the current year would be very much reduced. The Directors, having gone very carefully into the matter, were satisfied that with the price of 3s. for gas they would be able to pay their statutory dividends and interest during the current year, and also have a fair amount to pay back to the reserve. He wanted not only the proprietors but the public to remember that during two years they had taken £25,000 out of the reserve fund—in other words, they had charged the public £25,000 less for gas than it had cost the Company. He trusted, therefore, the public would be satisfied with what they had done and with the reduction they had made. Speaking of the position of the Company as regarded the Corporation, he said that the audit had now, he believed, been completed, though he was not aware that any report had been made. They awaited with every confidence the report which the able Auditor of the Corporation would make in reference to their accounts; and they felt perfectly satisfied that, in his rigid examination of their accounts, he would find nothing of which the Company had to be ashamed, or anything to which he could point as being wrong. As to the position of the Corporation accounts, he would have been glad if he had been able to say that a settlement had been arrived at all; but such was not the case. They had done all in their power to arrive at an agreement; but, for some reason, their advances so far had not been responded to. He, however, trusted that no unpleasant contest would possibly arise between two large public bodies like the Corporation and themselves, on both of which so much of the interests of Liverpool depended.

Mr. H. B. GILMOUR seconded the motion.

The CHAIRMAN, in reply to questions, stated that the reserve fund, including the £6245 which had to be appropriated to meet the dividends, stood at £70,625. The works at Garston had not yet been completed. But they were progressing rapidly; and he hoped that during the winter they would be able to test them, and see what was really the result of the new process. As to the cost of the Company's offices, they received from the Railway Company £45,000; while the land and the building of their new premises had cost £43,059.

The motion was then carried; and the dividends recommended were afterwards declared.

The usual acknowledgment of the services of the Chairman and Directors was passed; and the CHAIRMAN, in reply, observed that the thanks of the proprietors were also due to the officials for the able way in which they had devoted themselves to the affairs of the Company.

## BRISTOL GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Friday—Mr. J. W. S. DIX in the chair.

The SECRETARY (Mr. J. Phillips) having read the notice convening the meeting, the report and accounts, an abstract of which appeared in the JOURNAL on the 14th inst., were taken as read.

The CHAIRMAN, in moving the adoption of the report, said it was a matter for congratulation that the accounts were in so satisfactory a condition; and it was gratifying to be able to report the pleasing position which the Company now occupied. Notwithstanding electricity, the quantity of gas consumed went on augmenting. In the past half year, the sale was upwards of £2000 in excess of the corresponding six months of 1893; and it was increasing at the present time. He saw no reason why this should not continue; for, to his mind, there was plenty of room for both electricity and gas. At any rate, their own figures were very gratifying. Besides adding £5000 to the reserve fund, they had reduced the price of gas by 2d. per 1000 cubic feet, and carried forward a substantial balance.

Mr. H. A. MEDWAY, in seconding the motion, said he thought they had no reason to fear electricity.

The motion was adopted, and a dividend at the rate of 5 per cent. per annum was declared.

A vote of thanks having been passed to the Directors,

The CHAIRMAN, in reply, stated that in the course of a year the number of cooking-stoves supplied by the Company, apart from heating-stoves, had increased by 534.

The proceedings then closed.

## CRYSTAL PALACE DISTRICT GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Charles M. Ohren) read the notice convening the meeting; and the report and accounts, which were summarized in last week's issue, were taken as read.

The CHAIRMAN said the first words he had to say were in explanation of his appearance in the chair. His friend, Mr. Linging (who had so worthily occupied it for a great number of years, and had previously acted as Deputy-Chairman for many years) had, more than once or twice, urged upon him the advisability of his giving up the honourable position of Chairman in his (Mr. Livesey's) favour; and at last he had put it in such a way that he could no longer refuse. It was a great satisfaction to his colleagues that, though Mr. Linging had chosen to retire from the chair, they still had his valuable assistance and vast experience on the Board to help them as he had done during more than 30 years. Proceeding, the Chairman said he had now to move the adoption of the report and accounts; and he would make a few comments upon them. Happily, they were in the position of having little or no history at the present time, which meant a condition of peace and prosperity. The report dealt fully with the state of the Company; and the accounts needed practically no explanation, as they showed, also very clearly, what was their position. The shareholders were told in the second paragraph of the report that the moderate price of coal had helped them to a position of prosperity. It was satisfactory to be able to state in regard to coal that, while they had an increase of 2·63 per cent. in the quantity of gas sold, they had used 1026 tons of coal less. He was also glad to congratulate the Engineer on having brought down the unaccounted-for gas to something less than 4 per cent.; the percentage in the June half of 1893 having been 7·36. Another thing that had assisted them had been the enhanced price of coke. This was one of the good things that came out of the disastrous strike of the colliers last year. They made coal so scarce in London that there was a great demand for coke; and that demand, even yet, had not slackened off. He thought the strike had been the means of showing a large number of consumers that coke was a more valuable fuel than they had previously supposed. They were forced to use it at that time; and they had found it advantageous to continue its use. Sulphate of ammonia had likewise improved. They had done very well with it; but he hoped that they would do better still. They were one of the first companies to adopt the manufacture of sulphate; and, as a consequence, they put in apparatus which had now become obsolete and old-fashioned. New plant had recently been erected, and would commence working in a month or two. The Directors anticipated that, by the use of this new apparatus, their returns for sulphate would be considerably better than at present. The next paragraph of the report dealt with the question of the sliding-scale. This was the first half year in which they had come fully under its operation; and they were entitled to an extra dividend of ⅛ per cent. They had adopted the principle of issuing new capital at 5 per cent.; making the whole a 5 per cent. stock. It used to be very common to issue 10 per cent. capital, on which there was guaranteed an increased dividend of 5s. per cent. for every 1d. reduction in price. Now 2s. 6d. per cent. on 5 per cent. stock was precisely the same in effect as 5s. on 10 per cent. stock. They were, therefore, entitled at the present moment to declare a dividend of £5 2s. 6d. per cent.; but in the report the Directors informed the shareholders that they could no longer add to the reserve fund from surplus profits. If, therefore, they wished to increase the reserve fund at all, it must be by foregoing a certain amount of dividend. The Directors consequently came to the conclusion that it would be wise, instead of dividing these small fractions (on this occasion, the dividend was at the rate of 5⅛ per cent., or 2 $\frac{9}{16}$ per cent. for the half year), that they should, when selling gas at an odd penny, which entailed the 2s. 6d. per cent. dividend, add the latter to the reserve fund for, at any rate, some time to come. If this met with the shareholders' approval, they would that day declare a dividend of 5 per cent. Having reduced the price of gas by 1d. from the commencement of the current half year, they would be entitled to declare a dividend of 5¼ per cent. at the next meeting; and, unless something unforeseen happened, they intended that, when they were entitled to 5¼ per cent. it should be paid. While on this point, he thought he might allude to the last three or four years (which had been very difficult ones for gas companies), and show what had been the effect of the high prices of coal and labour upon this Company. Those high prices had entailed an extra cost on them of something like £40,000 in the course of three years—1890. They had really withdrawn from their reserves to the extent of £39,000—they had used up their contingent fund, the undivided balance, and had taken a considerable amount from the reserve fund. Having spent this money, they thought it was the turn of the consumers; and so they raised the price of gas 3d. per 1000 cubic feet. The effect of this had been that the consumers had contributed £21,000 up to Midsummer last towards the extra expense. They might say, then, that the extra cost of coal and labour had been £60,000 during the past few years, of which the consumers had contributed one-third, and the Company two-thirds. He had already stated that the Board had reduced the price of gas; and he should like to say that it gave them great satisfaction to do this. They were in some doubt, when the time came for arriving at a decision, whether they would be able to make the reduction; but, following the practice they had pursued for a great number of years, they determined to decide in favour of the consumer. He was happy to say that the time which had elapsed since the decision was come to had proved it was the right move, and that they would be able to hold their own at the reduced price. The next point he would allude to was the "penny-in-the-slot" meters. Many years ago, it was said by a great man that corporations and caterers for the public needs should lay themselves out for the supply of the million. That had proved to be the right and successful policy in regard to the railways, because they were told now that it was the third class passenger who paid the best. Happily means had been found by which the same principle could be applied to the gas business. In this Company's district, the greater part of the houses of the middle classes—he should say nearly all of them—were supplied with gas. There had not been much building going on during the last three or four years; and, in consequence, the increase of business had not been at the old rate. They used to double their consumption in twelve years; but it was not quite at that rate now. There had, however, come to their aid the "penny-in-the-slot" meters. It was found that the working classes of London were very ready to have gas if they could obtain it in such a way and on such conditions as would suit their purses. The Company had now fixed 1374 of these meters, which, he thought, was a very good account to lay before the shareholders, as they brought in an increase of business which the Directors considered would be very beneficial. They not only paid interest on the capital expended in providing the extra quantity of gas, but they also gave a surplus profit which would help the Company to make further reductions in price. Gas-stoves were also progressing; and in a large number of cases, the working class were adopting gas-cooking stoves—in fact, 459 had been supplied with the prepayment meters. He believed they were finding these stoves a great boon; because, particularly in the summer time, they saved them the expense of fires. The report also spoke of the increase of business. Although, during these bad times, it had not been at quite the old rates, still there was an increase, which necessitated further extensions of works and plant, and, consequently, the issue of additional capital. The Directors would, later in the proceedings, ask for authority to raise, in the course of the next two or three years, the sum of £55,000. They put it at this figure because their Act required them to issue ordinary and debenture stock in stated amounts. For instance, the first issue must be £15,000 of debenture stock, which they intended putting up for sale by auction in October; and the next issue would be £10,000 of ordinary stock. After that, £20,000 of debenture stock, and then £10,000 of ordinary stock. The Directors therefore asked for authority to raise £55,000, at such times and in such manner as they might find necessary or advisable. The next paragraph of the report related to the profit-sharing scheme; and, as the matter was explained at the previous meeting, the only remark he had to make on this point was that every man whom the Engineer could accept had assented to the conditions and signed the agreement. The condition that they imposed upon their employees was that they should sign an agreement or contract of service for any period not exceeding twelve months. These agreements were signed at different times; and thus the whole of the men could not leave at any one time. They were allowed, if their service could be dispensed with without detriment to the Company, by obtaining leave of the Engineer, to go at any time. The agreement was a perfect assurance against a strike. The great strike at the South Metropolitan Gas-Works nearly five years ago was in consequence of this agreement. All the men who were not in the Gas Workers' Union signed the agreement very readily; but the unionists almost to a man refused—indeed, the Union forbade them to sign. But in the case of the Crystal Palace Company he believed some of the men were members of the Union; and these had been as eager as the rest to sign the agreement. This indicated a very different state of things to that which existed at the time of the strike referred to; and they might consider it very satisfactory. With regard to the dividend, it was now to be a uniform 5 per cent., which was, in fact, making the nominal dividend correspond to the actual dividend. In a

good many companies, the nominal dividend was at a higher figure; whereas the actual dividend or interest received by the investor was only 5 per cent., or a little less. They had now placed the whole capital on the same footing; and this the Directors believed had been found beneficial by both shareholders and consumers.

The DEPUTY-CHAIRMAN (Mr. F. L. Linging) seconded the motion.

Mr. BEETON: Has all the capital already authorized been called up?

The CHAIRMAN: Yes; and we are £2000 in debt to our bankers.

Mr. COPPIN thought the shareholders were to be congratulated upon the very satisfactory condition of their affairs. With reference to the ½ per cent. extra dividend to which the shareholders were entitled, he considered the Directors had, under the circumstances explained by the Chairman, exercised a wise discretion in carrying this to the reserve fund. He asked how they provided for fluctuations in their profits.

Mr. FORTESCUE FLANNERY expressed his pleasure at seeing at the head of the Company the gentleman who made such an impression upon the gas industry at the time of the South Metropolitan strike. Had it not been for the vigorous and manly effort which he then made, things would, in all probability, have been very different, not only with that Company, but with gas companies generally. While appreciating in the fullest manner the faithful services rendered to the undertaking by their late Chairman, and regretting the cause of his resignation, the shareholders were very glad the position had fallen into the capable hands of Mr. Livesey. He approved of the policy of the Directors in building up the reserve fund by appropriating the odd ½ per cent. as was proposed; and, speaking of the increased make of gas with a decreased consumption of coal, he attributed this result to the skill of their Engineer (Mr. Charles Gandon). With regard to the new capital, he pointed to the success of the policy of the South Metropolitan Company in issuing fresh capital by auction; and he hoped the Board would follow the same course, and not raise the new capital by tender. He also asked for some information as to the lines on which the profit-sharing scheme was worked.

The CHAIRMAN, in replying first as to the reserve fund, stated that, in the old days, gas companies were allowed to build up a reserve fund equal to 10 per cent. of their capital out of surplus profits, after paying the full dividends. Under the sliding-scale, that power was ended; and the reserve fund could only be increased by foregoing a portion of the dividend and the increment of interest. The reserve fund on Dec. 31 last amounted to £37,795. The interest on this (which was all invested) was £509; and they had transferred to the fund £334, which was equivalent to the 2s. 6d. per cent. They had therefore increased the fund to £38,638. Besides the reserve fund, they had the undivided profits. The balance of profit carried foward on Dec. 31 last was £18,186, out of which they paid the dividend, amounting to £4875. The balance carried forward this June was £20,134; so that, whereas in December they had a surplus of about £3300, they would have now, after paying the dividend, a surplus of rather more than £5000. This undivided balance might be carried forward half year by half year until it amounted to £20,000. By their Act, the undivided balance was limited to this sum. The limitation, however, was a mistake; and he was happy to see that Lord Morley and his legal adviser (Sir Joseph Warner) had decided that this limitation was wrong; for in two Gas Bills that had been passed this session—the Harrow and the Plymouth—in which the opponents had secured the insertion of some limitation of the undivided profits, Lord Morley had struck it out. He might mention the Plymouth case because he happened to be before Lord Morley when the question was raised. The Company were limited to £10,000 of undivided balance; and although the Agent for the opposition was present, and urged his Lordship to let the clause stand, he struck it out. He (the Chairman) would therefore imagine that in future no limitation would be imposed. In their own case, however, they had a limitation; and it meant that when, after paying the dividend, the balance amounted to £20,000, they would have to reduce the price of gas. He could only say that they would reduce it before the balance amounted to that figure; so that the proviso would be a dead letter in their case. With regard to Mr. Flannery's remarks, the next issue of capital would be debenture stock; and this they had decided to sell by auction. But when they came to issue ordinary stock, they had a limited power under their Act to offer it to the consumers; and it would be a question whether it might not be to the advantage of the Company to give the consumers the opportunity of taking up the stock at the market price, and thus spread the Company's base (so to speak), and give them a more solid foundation among the consumers by making them shareholders. The debenture stock he thought was unquestionably best sold by auction. It was taken by people and corporations who wanted to invest money in something safe; and so they would give a high price for it. He concluded by describing shortly the method upon which the profit-sharing scheme is worked.

The motion was then adopted.

On the proposition of the CHAIRMAN, seconded by Dr. F. HETLEY, a dividend at the rate of 5 per cent. per annum on the preference and ordinary stocks (less income-tax) was next declared.

The following resolution was also agreed to without discussion: "That the Directors be, and they are hereby authorized to raise, in addition to the present capital, the sum of £55,000 of ordinary and debenture stock, in such manner, and at such times, as they may deem expedient, in accordance with the provisions of the Crystal Palace District Gas Act of 1893."

Mr. T. GUYATT subsequently moved, and Mr. PUNT seconded, a vote of thanks to the Chairman and Directors. This having been accorded,

The CHAIRMAN acknowledged it; and he afterwards proposed that a similar compliment be passed to the officials and staff—referring especially to the commendable services of Messrs. Gandon and Ohren.

The proceedings then terminated.

**The Electric Lighting Purchase Question at Fareham.**—The Fareham Local Board have amended the resolution which they recently adopted regarding the purchase of the electric lighting works by deleting the offer which they made to the Company, and substituting the words "that valuers should be appointed." This will to some extent meet the views of the ratepayers who, in public meeting, lately passed a resolution objecting to an offer being made by the Board without proper expert advice.

## BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly Meeting of this Company was held last Thursday, at the Guildhall Tavern, Gresham Street, E.C.—Mr. JAMES GLAISHER, F.R.S., in the chair.

The SECRETARY (Mr. Alfred Lass, F.C.A.) read the notice convening the meeting; and the report and accounts, which were referred to in last week's issue, were taken as read.

The CHAIRMAN, in moving the adoption of the report, remarked that it was so like that of the corresponding period of last year and the preceding one that it was, as it were, a link in a chain of great uniformity; and he thought it would be gratifying to the shareholders to see that the work was being so steadily carried on. With respect to the gas undertaking, if they compared the revenue account with that for the corresponding period of 1893, they would find that on the private lighting £313 more had been received, and that the public lighting had increased by £24—making together £338, which was a steady advance. As to the residual products, every one showed an increase; amounting altogether to £321. The total receipts on the gas undertaking amounted to £8918—a very different item to that of which he had to speak a few years since. Regarding the expenditure, they found that the cost of coal had been larger by £165; but it should be borne in mind that they had made 1,836,000 cubic feet more gas. This, of course, meant an increase of business; and so it was a pleasing and satisfactory item. An additional £60 had been spent upon repairs and maintenance. Repairs were constantly going on; and this was one of the explanations of the uniformity which the balance-sheet presented year after year. The total expenditure was £5912, which was greater by about £330 than in the corresponding half of last year. The balance of profit was £3005, which was an increase of £340. If they could keep this up half year by half year, they would soon be earning the amount required to pay the statutory dividends; but the shareholders must not hurry the Directors in this respect. Turning to the water revenue account, there was, in the first quarter of the year, an increase on domestic supplies of £186, and in the second quarter one of £157; but the increase upon the whole of the supplies was only £55. This was accounted for by the fact that the rents from meters and other supplies were £313 less. Last year, it would be remembered, was a dry one; and the water required for building and other purposes in the district could only be obtained from the Company's mains. Therefore their water receipts for the past half year—amounting to £8338—showed the normal increase, as the year with which they were making the comparison was an abnormal one. Notwithstanding this, the profits on the water undertaking were only £18 less than last year; so that this branch of their business was proceeding quite as well as that of the gas, which, he was sure, would be a matter of satisfaction to the proprietors. There was an item in the balance-sheet on this occasion, amounting to £3940, under the head of suspense account, which needed some explanation. This amount was expended in deepening the well at Finchley and in driving adits; but, there being no water, the well had been abandoned. Many years ago, before any one of the present Board was connected with the management, the site at Finchley was chosen for a well; and some £13,000 or £14,000 was spent upon it. It was sunk to the depth of 247 feet; and was then abandoned. The present Board had been anxious to make the expenditure available. They consulted the best geologists and hydraulic engineers, who advised them that the spending of a few thousand pounds in deepening the well and driving adits would give them water. But they had spent £3940 in this way without profit; and, under the circumstances, he was sure the proprietors would approve of their action. He proceeded to refer also to another item of the suspense account—£2174, for deepening the wells at New Barnet and driving adits, and for other works in progress not yet charged to capital account. From these adits, he mentioned they had derived a considerable increase of water. He also called attention to the renewal fund of £1800; and, before concluding, he gave some further particulars as to the work which had been done at the Finchley well.

Mr. C. HORSLEY seconded the motion.

Mr. DYER referred, in eulogistic terms, to the management of the Company's affairs, and stated that he remembered the time when the capital stood at something like £20 or £21 per ton of coal carbonized; while now it was £13 1s. 6d. He knew that this was still heavy. But looking at the condition of the Company 20 years ago, it was a marvel to him that they were now in their present position; and this was largely due to the good management of their Engineer (Mr. T. H. Martin) and the Secretary. With regard to the well at Finchley, he was sure that, taking into consideration the amount of money that had been formerly spent upon it, there was not one shareholder who would say the Directors had done wrong in trying to recoup to some extent that outlay.

Mr. R. T. PEAT called attention to the success of the "penny-in-the-slot" meters in the South Metropolitan Gas Company's district; and he inquired whether the Directors had considered the question of introducing them at Barnet.

The CHAIRMAN replied that they already had some prepayment meters in use in the district; and they would, as far as they could, press the system.

Mr. R. PEERS referred to a visit he had paid to the Company's works, and said he was gratified at finding everything in good condition, and also that they were now paying 9 per cent. dividend on the "A" and "C" stocks.

The motion was then unanimously carried.

On the motion of the CHAIRMAN, seconded by Mr. A. BAYNES, dividends were declared at the rates per annum of 9 per cent. on the "A" and "C" stocks, 8 per cent. on the "B" stock, and £6 6s. per cent. on the "D" capital (water shares), all less income-tax.

Votes of thanks were next passed to the various officials and to the Chairman and Directors for the admirable manner in which they had conducted the affairs of the Company.

An Extraordinary Meeting was then held, "for the purpose of authorizing the raising, by the creation and issue of new ordinary shares of £10 each (nominal value) or stock of the Company, a sum not exceeding in the whole £100,000 in the proportions following—

viz., "D" capital, gas, £33,200; "D" capital, water, £66,800—as authorized by the Barnet District Gas and Water Act, 1883; and also to authorize the borrowing on mortgage of the undertaking £3125 in respect of each £12,500, forming part of the above £100,000 "D" capital of the Company; and also to consider and determine as to the passing of a resolution for the conversion or consolidation into "D" capital water stock of the Company of 5000 fully paid-up "D" water shares of £10 each, forming part of the additional capital authorized to be raised by the Company's Act of 1883, such stock to be divided amongst the holders entitled to the said shares, according to their respective interests therein."

The CHAIRMAN remarked that a good many years had passed since the shareholders had authorized the Directors to raise money for the purposes of the undertaking; and all that had been so authorized had been wisely, economically, and effectively spent by them. They saw the result that day—a very different one to what it was some 20 years ago. They then met without declaring a dividend. That, however, was not the fault of the present Directors; but it opened their eyes, and was a stimulus to them to try to put the thing right. It would be many years before they would call up all the money which they now sought authority to raise; and afterwards they would have to go to Parliament again. He might mention that, with reference to the £33,200 of gas capital, that this would have to be raised by auction or tender; but the £66,800 water capital would be, as hitherto, divided among the shareholders *pro ratâ* according to their holding.

Three resolutions were then separately moved by the CHAIRMAN, and seconded by Mr. HORSLEY, carrying out the objects of the meeting, as quoted above; and they were all agreed to.

Mr. DYER inquired whether the Directors had power to allot the capital to be borrowed, as 4 or 5 per cent. perpetual debenture stock, among the shareholders, as he thought it highly desirable that they should also be debenture holders. He asked this because they were not likely to get anything in this shape from Parliament again.

The SOLICITOR (Mr. C. A. Bannister) replied that the Board had the power to issue the money as debenture stock among the shareholders; but it would be a matter for the consideration of the Board whether they would issue it to pay 4 or 5 per cent., seeing that money could now be obtained at 3½ per cent.

The CHAIRMAN having promised that the matter should be considered by the Board, the proceedings terminated.

## CROYDON COMMERCIAL GAS COMPANY.

**The Amalgamation of the Croydon and Carshalton Companies—Reports and Accounts of the United Concern—A Reduction in Price.**

In view of the amalgamation of the Croydon and Carshalton Gas Companies, the proceedings at the meeting of the shareholders to-morrow will be of exceptional interest. The accounts of both Companies as existing prior to the amalgamation will be presented; the remuneration of the Directors and Auditors will have to be re-considered; and resolutions will be submitted having for their object the consolidation and conversion of the seven classes of shares into three classes of stock, according to their respective statutory rights, and providing that all transfers of stock shall be of £5 and multiples thereof. Sanction will also be sought by the Directors to borrow on mortgage the sum of £12,500, which the Carshalton Company were authorized to raise; such power being now vested in the Croydon Company.

The Directors open their report by announcing that the Bill providing for the amalgamation of the Companies on July 1 received the Royal Assent on the 3rd of that mouth. The capital of the Carshalton Company is, under the Act, converted into a separate capital of the Croydon Company, having the same initial price, but having special regulations of its own as to sliding-scale of dividend and price of gas. It is believed that this enactment will, by the reduction effected in the cost of manufacturing the gas to be supplied in the Carshalton district, be advantageous to both classes of the Company's shareholders, while the Carshalton consumers will secure an immediate reduction of 1s. per 1000 cubic feet. The statement of accounts of the Croydon Company, as existing prior to the amalgamation, for the half year ended June 30, shows an increase of 5·91 per cent. in the sale of gas, compared with the corresponding period of 1893; and the residuals, with the exception of tar, have produced better prices. The amount available for division is £19,667; and the Directors recommend the payment of the usual dividends, at the rate of 14 per cent. per annum on the capital of £51,600, and at the rate of 11 per cent. per annum on the capital of £152,500 (less income-tax), for the half year. These dividends will amount to £11,999, and leave a balance of £7668. In the Croydon district, 120 additional gas cooking and heating stoves have been supplied; making the total number now on hire 2573. The Company have also fitted up 114 additional cottages under the weekly prepayment system; making the total 922. Since the last meeting, the Directors have sold, by public tender, 500 new ordinary shares of £10 each, which realized an average price of £22 9s. 4d. per share. As to the works, which the Engineer (Mr. J. W. Helps) reports in efficient order, contracts have been made for the construction of an additional gasholder and brick tank, and for a new trunk main for the supply of the Carshalton district. The Directors further announce that they have decided to reduce the price of gas in the Croydon district from 2s. 10d. to 2s. 9d. per 1000 cubic feet, from Midsummer. Regarding the accounts of the Carshalton Gas Company, as existing prior to the amalgamation, for the half year ending June 30, the Directors remark that they show an increase in the sale of gas. As the price in the Carshalton district is now reduced to 3s. 6d., the Directors hope thereby to considerably increase the consumption. The amount realized from residuals is in excess of that for the corresponding period of 1893. The sum available for division is £2862; and the Directors recommend the payment of a dividend at the rate of 9 per cent. per annum on the "Carshalton" capital (less income-tax) for the half year. This dividend will amount to £1350, and will leave a balance of £1512 to be carried forward. Before concluding the report, the Directors observe that the shareholders will regret to learn that Mr. W. Hyslop, who has been one of the Directors since the formation of the Company in 1847, and who has rendered valuable services for nearly fifty years, has resigned. At the last general meeting, Mr. Hyslop impressed upon the shareholders the desirability, in the event of a vacancy on the Board, of obtaining the assistance of an experienced gas engineer; and the Directors, adopting that view, have elected Mr. Corbet Woodall.

The following are a few figures from the half-year's accounts of the Croydon Company: The sale of gas realized £34,129; meter, stove, and fittings rental, £1649; residual products, £13,501; and cottage rents, £66—making a total revenue of £49,345. On the manufacture of gas £27,580 was spent; on distribution, £3754; on public lighting, £611; for rents, rates, and taxes, £1551; for management, £1591 and on sundries, £657—the total being £35,744; and the balance, within a few pence of £13,600. As to the results of the manufacturing operations, it appears that 23,375 tons of coal and 153 tons of cannel were carbonized during the six months; the amount of gas made being 248,758,000 cubic feet. The estimated quantities of residuals produced were: Coke, 282,336 cwt.; breeze, 54,524 cwt.; tar, 221,084 gallons; ammoniacal liquor, 600,123 gallons; and sulphate, 211 tons. With regard to the Carshalton Company, the revenue account shows receipts amounting to £4162; and an expenditure of £2787—leaving a balance of £1425. The quantity of coal carbonized was 1686 tons; the gas made, 16,203,000 cubic feet; and the yield of residuals was as follows: Coke, 18,527 cwt.; breeze, 1478 cwt. tar, 20,145 gallons; and ammoniacal liquor, 20,920 gallons.

## PROVINCIAL GAS AND WATER COMPANIES.

In the following paragraphs will be found some particulars as to the position, at the close of the past half year, of the several Gas and Water Companies mentioned.

### Gas Companies.

The shareholders of the Aldershot Gas and Water Company held their half-yearly meeting on the 15th inst. The Directors reported that there had been an increase in the consumption of gas by the ordinary consumers of fully 10 per cent. The increase on the lamp supply and that to the War Department had not been large; but the average on the whole was about 7½ per cent. The quantity of water pumped continued to show a large augmentation. The demand had been satisfied without stint or stoppage; and the pressure in the mains had been increased by the introduction of a water-tower 30 feet above the level of the reservoirs, by which highly situated houses were better supplied. A dividend was recommended at the rate of £11 1s. per cent. per annum on the "B" shares. The works reported last half year (which were designed to meet a larger demand for gas) had been continued; and a further alteration was being made in one of the coal-stores to accommodate an increased deposit, and also to facilitate storeage by means of hydraulic machinery. Regarding the water-works, the construction of a deep tank or dry well at the pumping-station, with the ultimate object of tapping the bore-tubes at a lower level than at present, was being proceeded with. A new delivery main to the reservoirs was also being laid; and the land partly surrounding the reservoirs, to the extent of fully 4 acres, had been purchased. The Chairman (Mr. A. F. Wilson), in moving that the report be adopted, said the increase in the gross revenue for the six months was nearly £800 over the corresponding period of 1893; and the net balance was the highest they had ever had. The quantity of gas sold realized an additional £332; the residual products, £224; and water, £245. On the other hand, coal cost £223 more; fuel for pumping, £25; salaries, wages, and repairs, £125; distribution, £55; and general charges £72 beyond the expenses of last year. The private consumption of gas had increased fully 10 per cent.; and the water supply had jumped from 96 up to 118 million gallons in the half year. The capital account had been increased by £3636. To meet this and also to prepare for further payments in connection with the new works, the Directors had issued £830 of 6 per cent. (1879) shares, and £4824 18s. 4d. of 6 per cent. (1890) shares; the result being that the balance of unexpended capital had risen from £721 to £3016. Besides these issues of new shares, they had re-arranged the interest on £6200 mortgage; reducing the rate from 4 to 3½ per cent. The report was adopted.

The accounts of the Bath Gas Company for the past half year show a most favourable balance on the revenue account. There has been an increase in the gas-rental, and a satisfactory addition to the receipts for residual products; while the working expenses are low as compared with the corresponding half of 1893. The revenue came to £33,643, of which the principal items were: Gas, £25,970; meter-rental, £539; stove-rental £297; and residual products, £6675. The expenditure, amounting to £23,557, was divided as follows: Manufacture, £18,500; distribution, £1759; lighting and repairing public lamps, £585; rates and taxes, £1139; rents, £27; management, £1466; bad debts account, £71; and law charges, £6. The profit on the working is, therefore, £10,086. The balance of net profit, subject to the half-year's dividend, is £13,251; and the Directors recommend that the maximum dividends be paid.

The result of the working of the Maidstone Gas Company during the year ending June 30 last was a profit of £8588—the revenue having amounted to £32,446; and the expenditure, to £23,858. The balance at the credit of the profit and loss account was £12,829; and from this the Directors recommended, at the meeting of the shareholders last Thursday week, the declaration of a dividend, less income-tax, at the rate of 10¾ per cent., of which 5 per cent. had been already paid. In moving the adoption of the report and accounts, the Chairman (Mr. Ambrose Warde) made an interesting speech, in the course of which he stated that the half-year's dividend would absorb about £4400; leaving £8400 to be carried forward. The Board had decided to add £800 to the renewal fund. There had been an increase in the capital expenditure of above £6000; and the working capital per ton of coal now amounted to £5 10s. 3d., which was rather high. This was easily accounted for by the reduction in the consumption of gas by the closing of paper-mills and by the increased capital expenditure. They had made 10,900 cubic feet of gas per ton of coal, which was a very good yield, and had sold 10,270 cubic feet. Another item in their

favour was the reduced consumption of coke on account of the adoption of regenerator furnaces. In the previous year, he believed they used about 37 per cent. of the coke for heating the furnaces; while in the past year, they had only consumed about 18¾ per cent. In passing, he might say that the Directors had decided to reduce the price of gas 1d. per 1000 cubic feet, to take effect from July 1 last. The price in future would thus be 2s. 4d., which would give the shareholders another ¼ per cent. dividend; but, as a matter of fact, they must reduce the price for a year before they could take any increased dividend. However, seeing the amount they were carrying forward, which was in excess of the sum required for the year's dividend, it was certain that they would be able to pay the increase in twelve months' time, and so make their dividend 11 per cent. The reduction in the price of gas and the extra sum they would require for dividend next year would make a difference of nearly £1000 to the Company—£800, or 80 per cent., of which would go to the consumers; and £200, or 20 per cent., to the shareholders. The Company were prospering; and he had no doubt that they would continue to do so. He found that in 1885 they went down from 2s. 8d. to 2s. 6d. in the price of gas; in the year 1889, from 2s. 6d. to 2s. 5d.; while this year they had come to 2s. 4d. He thought the success of the Company was to be attributed in a large measure to the fact that they employed the very best appliances. They were the first to use West's improved stoking machinery; and no doubt they had received, and would continue to receive, great benefit from it. The usual complimentary votes were passed to the Directors and officials—Messrs. H. Smythe and G. Baldwin replying on behalf of the latter.

The shareholders of the Pontefract Gas Company met last Tuesday, and received a report for the past half year, which stated that the amount divisible among the shareholders was £1144, out of which the declaration of a dividend of 10 per cent. on the original shares and of 7 per cent. on the new ordinary shares was recommended. The reserve fund now amounts to £2837. The Chairman (Mr. T. W. Tew) having moved the adoption of the report, the Mayor (Mr. Taylor), in seconding, said this was the first half year since July, 1890, that they had been able to make sufficient profit to pay the full statutory dividend without trenching upon the reserve fund. They had made 800,000 cubic feet more gas, using 10 tons less coal, than during the preceding year, which was due to retort improvements. The consumption of gas had increased from 13 million cubic feet 20 years ago to 34 millions; and now the Directors were compelled to provide some increased storeage capacity. To do this they had decided to make an additional call, on Jan. 1 next, of £1 per share on the new ordinary shares. The report was unanimously adopted.

In the course of the report which the Directors of the Reading Gas Company presented at the half-yearly meeting of the shareholders last Tuesday, it was stated that the additions to the works which have been in progress for some time past will be ready for use early in the forthcoming autumn. On account of the expenditure for the works, 250 £10 shares, bearing a dividend of not exceeding 7 per cent. per annum, were sold by public auction on April 5 last; realizing the satisfactory average of £15 10s. 3d. per share. Alluding to the visit to the works by the Incorporated Association of Municipal and County Engineers on April 7 last, and by the Incorporated Institution of Gas Engineers on May 11, the Directors mention that the President of the former referred especially to the Company possessing works among the most perfect, as well as modern, in the country; and the President of the latter highly complimented the Engineer (Mr. E. Baker) not only upon the general design of the works, but upon their completeness in point of detail, and upon the application of the best means to the most advantageous ends. As a precautionary step following the coal strike, the Directors state that they have thought it advisable to keep in stock a much larger quantity of coal than hitherto; and they have entered into contracts for the coal required for the current twelve months on satisfactory terms, although at a slight increase upon the prices of last year. The full dividends on all stocks and shares were recommended. The accounts showed that £20,645 was realized by the sale of gas at the rate of 3s. inside the borough and 3s. 6d. outside; £6481 was obtained from residual products; and £4 was received on stove account—making the total receipts £27,131. The total expenditure was £21,911, of which £17,388 was spent in the manufacture of gas; £1401 on distribution; £416 on lighting, &c., public lamps; £900 for rates and taxes; £73 for rents; £1110 for management; £500 has been transferred to the contingency fund; and £121 is entered for bad debts and allowances. The profit therefore amounted to £5220. The balance at the profit and loss account available for dividend was £15,407. During the half year, 12,745 tons of mixed coal were carbonized. The quantity of gas made is not stated; but the residuals produced consisted of 12,745 chaldrons of coke, 157,964 gallons of tar, and 116 tons of sulphate of ammonia.

The half-yearly meeting of the Salisbury Gas Company was held last Wednesday week; and the report presented was of a satisfactory character. Commenting upon it, the Chairman (Mr. G. Fullford) remarked that, after allowing for the increased sales of gas, the recent coal strike had cost the Company upwards of £1000. The receipts for gas, however, had increased by £442; and the residual products by £660—this additional revenue successfully covering the loss on coal, and enabling them to earn sufficient profit to pay the usual dividends without resorting to an increase in the price of gas as many other companies had done. The new gasholder was nearly completed, and would be ready for use in the ensuing winter. He moved the adoption of the report, and that the usual dividends, at the rates of 10, 8, 7, 6, and 5 per cent. per annum on the various classes of shares respectively, be declared. Mr. S. Griffin, in seconding the motion, remarked that the Company had for several years past paid full dividends, and there was no reason why they should not continue to do so. The new holder, which he regarded as a fine specimen of engineering skill, showed that they were providing for the wants of their customers, and obtaining greater security for an ample supply of gas even in the darkest and coldest weather. The motion was agreed to. In the course of the subsequent formal business, the Auditor (Mr. M. C. Fisher) made the interesting statement that 25 years ago the annual sales of gas amounted to 20 million cubic feet; while last year the total consumption was 69 millions.

The thirty-sixth half-yearly report of the Sevenoaks Gas Company shows receipts from all sources to the amount of £5526, and an expenditure of £3707; the result being a profit of £1819 for the half year. The amount standing to the credit of the profit and loss account, being the sum available for dividend, is £3140, which allowed of the usual payment of 10 per cent. on the original, and of 7 per cent. on the additional capital, both less income-tax. This dividend has been declared. The Company have purchased land near the works for the purpose of forming an unloading station for coal; and by this extension it is hoped to effect a considerable saving by lessening the cost of coal and the wear of draught horses.

The accounts of the Wellingborough Gas Company for the past half year have been issued; and they show that the total income was £5078; and the expenditure £3361—leaving a balance of profit of £1717, as against £1556 in the corresponding half of 1893. The balance on the profit and loss account is £1971; and the Directors recommend a dividend of 5½ per cent. on the "A" and "B" shares, and 4 per cent. on the "C" shares, free of income-tax. An analysis of the working results for the entire year shows that the coal used amounted to 5322 tons. The gas made was 56,176,200 cubic feet; or an average of 10,555 feet per ton; accounted for, 53,636,500 cubic feet, or an average of 10,078 feet; sold, 53,262,000 cubic feet, or an average of 10,008 feet; and the percentage of unaccounted-for gas was 4·52. The capital expended equalled £7 5s. 7d. per ton of coal. We also learn that the Directors have decided to reduce the meter-rents, which appear to them to have a check on the extension of gas supply among the artisan class. They will probably ultimately provide meters free; but for the present a charge of 6d. per quarter will be made for a three-light, and 9d. for a five-light meter. A reduction of 50 per cent. has also been made in the hire of larger meters—ranging up to 150 lights, for which 6s. per quarter will now be charged.

### Water Companies.

At the recent meeting of the Consett Water Company, the Directors reported that the receipts for domestic rental for the past half year were £261 in excess of those of the corresponding period of 1893; while, owing to the long drought of last summer and autumn, the meter-rentals were less by £1500—causing a total diminution of £1239. After payment of interest on bonds, income-tax, and management expenses, there remained an undivided profit of £5976. The Chairman (Dr. Boyd), in moving the adoption of the report, referred to the fact that the Company's Bill had passed through both Houses of Parliament. By the Act, the district to be supplied with water would be largely increased, powers were granted to acquire land, and to construct further storeage reservoirs; while the Company would be under an obligation to filter all the water used for domestic purposes. They had extended their mains through Lanchester to Esh Village; the Rural Sanitary Authority having contributed £2500 for the purpose. He considered that the prospects of the Company were very hopeful. The report was adopted; and a dividend of 6½ per cent. was declared on the share capital of £172,000.

The half-yearly report of the Directors of the Exmouth Water Company, which was presented at the meeting of the shareholders yesterday week, states that a contract concluded with Mr. W. H. Perry for the construction at Yettington of a compensation reservoir of 12 million gallons capacity has been abandoned; and a new contract has been entered into with Mr. Perry for a reservoir with a capacity of one-eighth of the original one. During the past half year some small works have been carried out in connection with the new supply, by means of which an increase of water has been obtained; and there is now a fine head of water in the storeage reservoir. The accounts show that the profit of the half year available for dividends is £841; and these have been declared at the rates of 7, 10, and 5 per cent. per annum on the original and ordinary shares.

According to the report which was presented by the Directors of the Wrexham Water Company at the recent annual meeting of the shareholders, the expenditure on capital account during the past year amounted to £2011. The income for the twelve months showed an increase of £191; and the number of houses supplied was augmented by 95—making a total of 4421. The drought and the coal strike caused an additional charge of £720 upon revenue. After payment of the usual charges, the full dividends upon the preference shares and stock, the interim dividend of 5½ per cent. upon the consolidated stock for the six months ended Dec. 31 last, and interest on mortgages for the year, a balance of £3164 remained on net revenue account. The Directors accordingly recommended the payment for the half year of the full preference dividends, and at the rate of 5½ per cent. per annum upon the consolidated stock, all tax free. The report was adopted.

The revenue account of the Yeadon Water Company for last half year shows a total income of £1593, including a balance of £517 from the previous account. The expenditure amounted to £1006; leaving a sum of £587 for distribution. The dividends which have been declared are at the rates per annum of 3½ per cent. on the original capital, and £2 9s. per cent. on the "B" stock. After these have been paid, there will only remain a balance of £25.

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**The Finances of the Bolton Corporation.**—The annual financial statement of the Borough Treasurer of Bolton (Mr. G. Swainson) has just been issued. The figures in regard to the Gas and Water Departments for the past financial year have already been given in the JOURNAL; but the results of the working may be again briefly stated. In the Gas Department, the sum applied in aid of the rates was £16,906, as compared with £14,546 in the year 1892-3; the amount set apart for renewals was £12,208, against £7500; and the sum transferred for the extinction of liabilities was £6000. The surplus assets of the gas-works stand at £639,943; the sum of £6057 having been added during the past year. In regard to the electric light undertaking, the statement shows that £3551 had been expended up to March 25 last in new works, &c.; and £141 is set down for deputation expenses of the Gas Committee. In the Water Department, the balance of profit applied in aid of the rates last year was £12,000; a sum of £2414 was set apart for the extinction of the mortgage debt; and the amount put aside for the renewal of mains was £2663. The total net indebtedness of the Corporation is £2,117,358.

## METROPOLIS WATER SUPPLY.

### The Quality of the Water during the Month of July.

The returns furnished to the Registrar-General by the London Water Companies as to the water supply of the Metropolis during the past month, show that the average daily supply was 216,653,007 gallons, as compared with 206,897,592 gallons in the corresponding month of 1893. The number of services being 807,250, the rate was 268 gallons to each service. Of the entire bulk of water sent out, 110,982,911 gallons were drawn from the Thames, and 105,670,096 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: Taking the average amount of organic impurity in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies was: Kent, 0·7; New River, 1·3; East London (deep well), 1·7; Colne Valley, 1·9; East London (river supply), 2·4; Chelsea, 2·9; West Middlesex, 3·1; Grand Junction, 3·2; Southwark, 3·4; and Lambeth, 3·6. The unfiltered river waters contained the following proportions: Thames at Hampton, 6·5; New River Cut, 3·1; and the Lea at the East London Company's intake, 4·7. The Thames at Hampton was turbid and yellow in colour on July 16. It was bacterially inferior in quality, but chemically somewhat superior, to its condition on the 11th of June. As delivered by the five Companies drawing from this river, it was in every case efficiently filtered, and improved in chemical quality to the extent of about 50 per cent. The bacterial improvement effected by the operations of the Companies was expressed by the following percentage numbers: Chelsea, 98·74; West Middlesex, 99·79; Southwark, (No. 3 filter) 92·59, (No. 8 filter) 97·62; Grand Junction, (Hampton general filter) 96·36, (Kew filter) 98·11, (Kew south filter) 98·81; and Lambeth, 99·16. The New River Cut was turbid and very pale yellow in colour on the 17th of July. It was bacterially of slightly better quality than on the 12th of June, but chemically scarcely so good. It was efficiently filtered before delivery; and it was improved bacterially 96·15 per cent. In respect of organic purity, it again ranked with the deep-well waters. The raw river water of the Lea at Hertford was of very bad bacterial quality;* being much inferior in this respect to the water of the same river at Angel Road. Even at the latter point, however, it was bacterially much inferior to the Thames at Hampton, although considerably better in chemical quality. By storeage and filtration, the water abstracted from the Lea at Angel Road by the East London Company was improved, before delivery to consumers, chemically 50 per cent., and bacterially, in the case of No. 1 Essex well, 87·87 per cent., and in the case of No. 2 Essex well and the West Middlesex well, to the extent of 98·47 per cent. The deep-well waters of the Kent and Colne Valley Companies were clear and bright, without filtration; but the East London Company's water from their deep well at Chingford was very slightly turbid. These waters were all of a high degree of organic purity, and were of excellent quality for dietetic purposes. The Colne Valley Company's water was softened before delivery; and thus rendered suitable for washing. Seen through a stratum 2 feet deep, the New River and Kent and Colne Valley Companies' waters were clear and colourless; the East London deep-well water, very slightly turbid and colourless; the East London river supply, clear and nearly colourless; and the remaining waters, clear and very pale yellow. The bacterioscopic examination of the raw river waters, before and after storeage, and of those supplied by the various Companies, collected on the 16th, 17th, and 18th of July, gave the results contained in the following table:—

| Description. | No. of Microbes per Cubic Centimetre. | Temperature in Deg. C. |
|---|---|---|
| *Raw and Stored River Waters.* | | |
| Thames at Hampton | 2860 | 16·7 |
| „ after storeage for 14·7 days (Chelsea Company) | 520 | 18·2 |
| Lambeth Company's water, after storeage for 6·4 days | 680 | — |
| Lea at Hertford | 6660 | 14·7 |
| New River Cut, at Green Lanes | 1560 | 16·7 |
| „ after passing first reservoir | 780 | 16·4 |
| „ after passing second reservoir | 260 | 16·6 |
| Lea at Angel Road | 4320 | 16·7 |
| „ after storeage for 15·1 days | 1120 | 17·2 |
| *Filtered River Waters as Supplied.* | | |
| Thames— | | |
| Chelsea | 36 | 18·4 |
| West Middlesex | 6 | 17·2 |
| Southwark, No. 3 filter | 212 | 17·3 |
| „ „ 8 „ | 68 | 17·0 |
| Grand Junction (Hampton general well) | 104 | 17·7 |
| „ (Kew general well) | 54 | 17·5 |
| „ (Kew south well) | 34 | 17·8 |
| Lambeth | 24 | 17·8 |
| Lea— | | |
| New River, general filter well | 60 | 16·7 |
| East London, No. 1 Essex well | 524 | 16·5 |
| „ No. 2 „ | 66 | 16·4 |
| „ Middlesex well | 66 | 16·5 |

The report presented to the Official Water Examiner (Major-General A. de Courcy Scott, R.E.) on the composition and quality of the water supplied to London during the past month, as ascertained by tests of samples taken daily on behalf of the Companies, bears the signatures of Professors Crookes and Dewar—the latter taking the place hitherto occupied by Dr. Odling. They report that, of the 156 samples examined, one was recorded as "slightly turbid," and five as "clear, but dull;" the remainder being clear, bright, and well filtered. These were all from the mains of the East London Company. The Company have just finished laying 4200 yards of new 24-inch main near the spot whence the samples were drawn; and the reporters say the disturbance thereby caused was amply sufficient to account for a slight turbidity in some of the samples. The suspended matter consisted of ferruginous and clayey particles of a harmless character. In the report for June, an excess of 0·58 inch of rain over the average was recorded. July was a still wetter month; the rainfall having been 3·27 inches—an excess of 0·89 inch over the 25 years' average o 2·38 inches. There was very little change in the quality of the water; the constituents remaining almost identical in quantity with those in the June waters, and also in the water for the month of July, 1893. The report concludes as follows: "Owing to an unexpected coincidence between the results of analyses of two of the waters, and the repetition of this coincidence for several months past, the conviction has been forced upon us that the samples of water collected for us, and presumed to be respectively from the New River and Chelsea mains, were, through some systematic error, really the same water. This has now been confirmed by tracing the origin of the samples, which turn out to have been drawn from stand-pipes supposed to be supplied by the different Companies, but really both supplied by the New River Company. Steps have now been taken which will render such a mistake impossible in the future. Although this erroneous labelling is most unfortunate, it is not altogether to be regretted, as it explains the apparent discrepancy between Dr. Frankland's and our figures in regard to these two supplies; and, moreover, it gives indirectly a confirmatory proof of the extreme accuracy to which water analysis has been brought, and the complete trustworthiness of our own analytical results."

* On this occasion, no barge had passed down the river for two days previous to the taking of the sample; and I am unable to offer any explanation as to the cause of this excessive bacterial pollution.

## THE WATER SUPPLY OF WORTHING.

### Local Government Board Inquiry.

An inquiry has lately been held at Worthing, by Major-General C. Phipps Carey, R.E., in regard to an application made to the Local Government Board by the Corporation of that town for power to borrow £61,500, mainly for the construction of water-works on the Downs, and the purchase of the undertaking of the West Worthing Water-Works and Baths Company. There was no opposition to the application; but certain Local Authorities were represented.

Mr. Corrie Grant, in opening the inquiry, said the Water Authority of the borough supplied a population of 16,000 people, who were assessed to the amount of £67,500. Outside the borough they supplied 1000 people, rated at £2101. There was a further district the water rights of which were owned by the Corporation and the West Worthing Water Company, the population of which was 96, and the assessment £1050. The Company's limits were the parish of Heene, with a population of 1700, and an assessable value of £15,872; and West Tarring, with a population of 1035, and a rateable value of £3299. By special agreement, they also had certain rights in the parish of Durrington (153 and £300); making, as far as the Company were concerned, totals of 2888 and £19,471. The assessable value of the entire borough for water-rate purposes on March 25 last was £89,318; and the borough, it was estimated, had increased since then, and was still growing. The loans of the Corporation totalled £85,983; and of this sum £19,363 was in respect of water supply.

Mr. *J. Mansergh*, M.Inst.C.E., the Engineer to the Corporation, said he had been acquainted with the water supply of Worthing for about thirty years; and he had been inquiring into the possibility of securing an absolutely pure service. A site had been selected 78 feet above Ordnance datum; and a well had been commenced. They had gone down 80 feet, and had reached water, which they were pumping at the rate of 120,000 gallons a day. They were working 20 feet below the water-level—the point of saturation. The estimate for this part of the work was £5200. The water was entirely free from any possibility of contamination. The well was above the level of the town; and there were 50 feet of impervious material above the chalk. Three or four miles inland, the water stood 300 feet above sea-level; and no doubt it was travelling in the direction of the coast. Contracts had been entered into for duplicate engines and pumps, each capable of raising 1,500,000 gallons of water a day. The supply in Worthing was now about 600,000 gallons daily; and in West Worthing, from 100,000 to 170,000 gallons—say, 700,000 gallons altogether. The contract amounted to £5900; and this plant was nearly ready to be delivered. A third contract for the buildings to contain this machinery had been advertised. The estimate was £5500. Some 600 or 700 yards to the north-east, on higher ground, it was proposed that an open circular reservoir should be constructed of brickwork and concrete in the chalk. It would be 20 feet deep, and would hold about 2,000,000 gallons. The estimated cost was £6300. There would be electric communication between the pumping-station and the reservoir. A 14-inch main was to be taken from the reservoir to the tank in the water-tower at Worthing. The estimates for the mains and connections to the existing pipes of the Corporation and of the West Worthing Company was £6789. The site was to be purchased of Lieut.-Col. Wisden—3 acres for the pumping-station, and 2¼ acres for the reservoir. This was estimated to cost £1203; and the coal-store would cost £300. Practically the water would have to be lifted 200 feet. He thought the Corporation were well advised in wishing to purchase the Company's works, in order to prevent any suspicion of further contamination by closing them. The works would be put out of use, and the district supplied from the new pumping-station.

Mr. Grant then explained that the West Worthing Water Company's works were constructed under an Act passed in 1884. It was felt by the Corporation that it was not safe to have within the borough, and in the district where building was going on, works which might be suspected of contamination at some future date. It was not a question of making a good investment, but of incurring any outlay to prevent any risk of the reputation of the town suffering. Mr. Mansergh, for the Corporation, and Mr. Quick, for the Company, had arranged the matter for the respective parties; and the question of value was referred to Mr. Woods as Umpire, whose award was to be forwarded to the Inspector. The arrangement was that Mr. Mansergh's figure was to be taken as a minimum. The Company asked for a total of

£26,180; Mr. Mansergh suggested £23,000 for the whole undertaking, including the new reservoir. The Company supplied Tarring and Durrington; and the Rural Sanitary Authority had arranged to enter into an agreement with the Council for the supply of these parishes.

Mr. *W. Verrall* (the Town Clerk) and Alderman *R. Piper* (the Mayor) having given evidence in support of the Corporation's proposal,

Mr. *J. Quick*, M.Inst.C.E., supplied some particulars as to the Company's works. He said the water was obtained from two wells, in which there were no headings, but simply borings. The site was very near the sea. The original well was 20 feet deep; and the boring went about 60 feet lower. The other boring was about 100 feet deep. The pumps were not deep-well pumps. There were two engines—one of 12-horse, and the other of 5-horse power—and boilers. The water was lifted through a 7-inch main to the reservoir at Coate—a distance of about four miles. The capacity of the reservoir was 150,000 gallons. It was covered, and was a little more than 100 feet above sea-level. There was abundance of water, and frequent analyses had proved it to be of exceptional quality. There were large swimming, and a number of hot and cold private baths. The original cost of the baths and water-works inclusive, was about £32,000. The expense of the 7-inch main and the reservoir was just over £5000 in addition. This included the site. Prior to the erection of the reservoir, the supply was intermittent; now it was constant, although the Company were not bound to make it so.

The INSPECTOR remarked that no further inquiry would be necessary on the subject of the Umpire's award, unless objection should be made to the new reservoir.

Mr. GRANT pointed out that, if the Corporation took over the West Worthing works, they would be bound, under the Public Health Act, to supply West Tarring and Durrington; but if they could not come to terms, the matter would have to be laid before the Local Government Board.

The inquiry, as far as it concerned the water-works, then closed.

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**Fraudulent Consumption of Gas.**—At the County of London Sessions on Wednesday last, before Sir P. H. Edlin, Q.C., William Young, a carpenter, was indicted for having stolen gas, the property of The Gaslight and Coke Company. Mr. Travers Humphreys appeared for the Company; Mr. Paul Taylor defended. It seemed that the workmen of the Company, in searching for an escape of gas at No. 33, St. Mary's Terrace, Paddington, had occasion to examine the pipes at No. 31, the basement of which house was occupied by the accused. They found that in the coal cellar an extra pipe had been attached to the service-pipe, so as to take gas from it before it reached the meter, and to feed a small gas-stove and a gas-jet in the scullery and the jet in a workshop in the yard. For the defence, it was admitted that the gas had been used without passing through the meter; but it was contended that the accused did not know of the way in which the pipes were connected, and that the one in question had been laid down by a fellow-carpenter, who occupied the workshop some years ago. Evidence was given that the defendant bore an excellent character; but the jury found him guilty. Sentence was postponed.

**The Daventry Town Council and the Water-Works.**—At a special meeting of the Daventry Town Council on Monday last week, Alderman Thornton, the Chairman of the Water Committee, stated that they had consulted Mr. J. Eunson, C.E., regarding the water supply of the borough; and he had advised that the best thing the Council could do would be to buy the Water Company's undertaking. In this view Mr. Thornton said he quite concurred; for he thought the water supply should be under the control of the Sanitary Authority. The present supply was not sufficient to meet the wants of the whole town; and if the Company extended their works, they would have to obtain parliamentary powers, which would probably cost £400. This was a cost that the Council would not have to bear. He thought they could make the Company a good and liberal offer, and yet make both ends meet. The Company had a capital of £1540; and their dividends were at the rate of 9 per cent. They offered to sell their works for £5000. This sum he did not think the Company expected to get; but still he thought a fair and reasonable amount might be offered by the Council, and the works be made to pay. He considered a fair and reasonable sum should be tendered; and he proposed that £3811 10s. be offered for the undertaking. In the discussion which followed, some of the members appeared to be a little dubious as to whether they would be able to "make both ends meet" if they acquired the works; and the matter was referred back to the Committee for further consideration and information.

**A New Holder at the Morecambe Gas-Works.**—The new holder which the increased consumption of gas at Morecambe has necessitated, was formally put into operation by the Chairman of the Morecambe Gas Company (Mr. W. O. Roper) after the Board meeting on the 8th inst. It has been erected, from plans and specifications prepared by the Company's Manager (Mr. W. Duff), by Messrs. Clayton, Son, and Co., Limited, of Leeds. The inner lift is 94 feet in diameter and 20 ft. 6 in. deep; the middle lift, 96 feet in diameter and 20 ft. 3 in. deep; and arrangements have been made for adding a third lift. There are twelve standards, 60 feet in height, 3 feet wide at the bottom, and tapering to 1 ft. 10 in. at the top, made of mild steel. The tank is 100 feet in diameter, 5 ft. 6 in. wide, and 20 ft. 9 in. deep; the top standing 7 ft. 4 in. above the ground. Before the gas was turned on, Mr. Roper referred to a similar event nearly sixteen years ago, when the then new holder was inaugurated. That holder would, he said, contain 125,000 cubic feet; and it showed the great increase in the prosperity of Morecambe that there should now be required an additional holder to provide storeage for a further 283,000 cubic feet. The new holder would contain that quantity of gas; and if the outer lift should become necessary, the holder would then be capable of containing nearly 440,000 cubic feet. The gas was liberated amidst hearty congratulations. It may be added that, when the last holder was erected, the price of gas was 5s. 5d. per 1000 cubic feet, with a discount of 8 per cent. if paid within a month. The price is now 3s. 3d. for cooking, heating, and motive power, and 3s. 11d. for lighting purposes.

## NOTES FROM SCOTLAND.

**From Our Own Correspondent.**

*Saturday.*

In Aberdeen hitherto, the municipal financial year has terminated on September 30. This has been changed; and there, as in other places, the year will close on May 15. The accounts from September to May have been made up; and it is announced that in the Gas Department there has been a profit of £7000. This would allow of a reduction in the price of gas of 3d. per 1000 cubic feet; but inasmuch as the electric lighting installation shows a loss of £500, which has to be made good out of the gas surplus, and other works have to be provided for, it is anticipated that the reduction will not exceed 2d.

Mr. R. F. Craik, the Convener of the Gas Committee of the Forfar Corporation, is a gentleman who possesses some originality of mind. The Corporation are, through the death of Mr. Esplin, engaged in selecting a new Gas Manager; and at a meeting on Monday night, Mr. Craik proceeded to instruct his colleagues as to the questions they should put to candidates for the vacancy who may call upon them. One of these was as to how it was that in Forfar they received 4s. 11d. for ammoniacal liquor and tar, while in other places only from 2s. 1d. to 3s. 6d. was received. The meeting did not take very kindly to Mr. Craik's proposed catechism, which is not to be wondered at, as it is scarcely the functions of a Convener to lay down to his colleagues what their course of action is to be outside the Council. At the same time, it is undoubted that the practice of canvassing the members of an appointing body by candidates frequently does harm; and there is some excuse for Mr. Craik taking it up. Probably a better advice than Mr. Craik's would be not to see candidates, except at a meeting convened for the purpose. The accounts of the Corporation for the past year were submitted and passed. They show an improvement of £281 on the year. Estimates for the year have been prepared; but it has been resolved not to consider them until after the appointment of the new Manager and the fixing of the coal contracts.

A good illustration of the disadvantages attaching to uninformed comparisons is furnished by what took place at the Greenock Police Board on Monday. At the previous monthly meeting of the Board, Dr. Cluckie, on the annual accounts being presented, entered into a denunciation of the Gas Committee because they did not realize the same results as are obtained in Paisley. Replying to this, on Monday last, Mr. M'Innes, the Convener of the Gas Trust, characterized Dr. Cluckie's statement as being inaccurate and misleading. His explanation of the difference in the results in the two places rested chiefly on the amounts of capital under which they work. Thus in Greenock they require £7485 a year for interest and sinking fund; while in Paisley the sum is only £3664. The Chairman of the meeting also called attention to a statement made by Dr. Cluckie as to the gross cost of coal in Paisley, which, he said, was not borne out by the report presented to the Paisley Commissioners. Dr. Cluckie said he would be satisfied if it could be explained how it was that in Paisley they could purchase coal 2s. 5d. per ton cheaper than they did in Greenock, giving gas which was better by 2-candle power, and better results in the way of residuals. The subject was sent to the Gas Committee—what for, it is difficult to say, because it might well have been allowed to rest.

It was reported to the Greenock Police Board on Monday, that the Gas Committee had given instructions to notify coal contractors who have not yet completed delivery of their respective contracts, that the Committee expected them to fulfil them within a reasonable time, failing which the Committee would exercise their powers under the contracts, and go into the markets to purchase coal, debiting the contractors with any loss which might result. Lest coal should be scarce, it was stated that a contract had been entered into for a month's supply, as a stand-by.

It is reported this week that the Glasgow Gas Trust are not likely to be affected by the strike of the miners, as they have still three months' supply of coal on hand.

An extension has been made of the installation of incandescent gas lighting in the streets of Portobello; the originally fixed lamps having given satisfaction. In Edinburgh, the Lighting Committee of the Town Council are about to light Nicolson Square with incandescent gas-lamps.

Bailie Westwater, of Kirkcaldy, has lately been enlightening his fellow-townsmen, through the pages of a local newspaper, upon several proposals, which he does not make, but merely suggests, towards the consolidation of public bodies and services in the town. Consolidation in municipal matters is in the air; and his suggestion is that the water, gas, and harbour affairs should be managed by the Town Council, and the funds of the whole consolidated and converted into town bonds. He makes out the liabilities of the Water Commission to amount to £110,000, of which £20,000 pertain to Dysart and £90,000 to Kirkcaldy; and that the capital account of the Gas Company stands at £39,677. In the case of the Water Commission, interest is paid upon the debt at the rate of from 3¼ to 3½ per cent.; the Gas Company, he says, upon their original shares, are earning 22½ per cent. Taking all the three bodies, he estimates their indebtedness at nearly £150,000. He thinks the town could borrow that at 3 or 3½ per cent.; and there would be economy. Perhaps nothing may come of this; but in case it be followed up, it may be pointed out that whatever might be case with the Harbour Commission and the Water Commission, certainly in the matter of the Gas Company, if they are earning 22½ per cent. (which must be upon very original shares), the town, in taking over the Company's undertaking, would have to pay well for such a valuable property.

The strike of Scotch miners has now lasted nearly nine weeks. Its vitality has been a matter of surprise to all; and as yet there are no certain indications of its coming to an end. The masters are resolute, holding to their original position. On the part of the men, a step has been taken which may result in something soon. This week the Executive of the British Federation met at York, and resolved that the Scotchmen should accept a settlement on the basis of 6d. per day being restored to them, instead of 1s., for which they struck. This decision is rather a blow to those of the men's leaders who have all along preached "No Surrender." A conference of delegates met in

Glasgow to-day to consider the York resolution; and, as the result of several hours' heated discussion, they agreed to take a ballot of the men on Thursday next. This gives the strike another week's life. I fully anticipate that this will be about all. The strike pay which was distributed to-day is now very small; being at the rate of 2d. per day, for six days of the week, and 3d. on the seventh. This sum for the maintenance of a whole family is, of course, ridiculously small—so small that, in fact, it is next to useless to collect it. It is evident that the miner has not much sympathy from his English brethren. Without sympathy, and support following, it is impossible that the strike can go on much longer. I look for a termination the week after next—that is, after the result of the ballot has been announced, which will probably be next Saturday.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 25.

**Sulphate of Ammonia.**—The continuous absence of orders of any importance is still affecting values, which show a declining tendency, but not of a pronounced character. It is not to be wondered at that manufacturers are beginning to lose heart; and there has certainly not been much encouragement during the past three months. The course of the market, and the circumstances connected with it, present a curious anomaly; and even the wisest of prophets could not to-day predict how its future will be shaped. There has been all along much in favour of improved values—little, if anything, to provoke a fall; still there had to be recorded a lower scale of prices month by month. Even, as already remarked, the impact has been insignificant. Sulphate must be required in many directions; but the present dulness is not likely to precipitate purchases. The market no doubt requires watching closely. There are to-day sellers at £13 12s. 6d. to £13 11s. 3d.; buyers' ideas generally not exceeding £13 10s. Nitrate continues firm at 9s.

LONDON, *Aug.* 25.

**Tar Products.**—Benzols are a little stronger, with more inquiry. Pitch is still firm both for prompt and for forward delivery; prompt delivery being worth at least 2s. to 3s. a ton more than forward price. There is a better demand for liquid creosote and heavy oils. Naphthalene, however, continues to be a drug; and carbolic and cresylic acids do not improve in price. Solvent naphtha is firm, with a good deal of inquiry. But the make of it, as well as the other tar products, at the moment, is at a minimum; and very little business is doing in any of them, excepting in connection with stocks which makers have been holding in the expectation of realizing better prices. Business during the week has been noted at the following rates: Tar, 15s. to 19s. Pitch, 34s. spot; 32s. forward. Benzols, 90's, 1s.; 50's, 1s. 0½d. Solvent naphtha, 1s. 3½d. Toluol, 1s. 4d. Creosote liquid, 2¾d.; ordinary, 1½d. Creosote salts, 17s. 6d. Cresylic acid, 10½d. Crude benzol naphtha, 30 per cent., 5d. Carbolic acid, 1s. 7d. Anthracene, "A," 1s. 1d.; "B," 10d.

**Sulphate of Ammonia.**—This market has been decidedly flat; and very little new business is reported. There are buyers at £13 10s., less 3½ per cent.; but makers are asking more money. Gas liquor is quoted at 10s. to 11s. 6d. per ton.

## COAL TRADE REPORTS.

**From Our Own Correspondents.**

**Lancashire Coal Trade.**—The only special feature just now to notice in connection with the coal trade of this district is the continued general unsettled feeling among the men with regard to the reduction in wages under the Conciliation Board settlement. At quite a number of collieries, there have been disputes and stoppages owing to the men not being satisfied with the reductions which are being put into effect by the coalowners; and although temporary arrangements have in most cases been made, by which the men have resumed work, it is, in the majority of instances, only pending the further consideration of the matter by the Conciliation Board, a special meeting of which has been summoned for next Friday. With regard to the condition of the coal trade, the position remains very much as reported recently. The local and inland demand for all descriptions of fuel continues extremely slow, with a good deal of undercutting in prices to get hold of orders. The only direction in which there is any approach to activity is in meeting requirements of Scotch buyers during the continuance of the miners' strike in that district. The protracted stoppage of the Scotch collieries has helped to take away a good deal of the surplus output of the Lancashire collieries, which would otherwise have been thrown upon the market; but it has not to any appreciable extent contributed towards better prices being obtainable. At the pit mouth, best Wigan Arley coals only in special cases fetch more than 11s. per ton; Pemberton four-feet, and seconds Arley, 10s.; with common house coals about 8s. In the lower qualities of round coal for steam, iron-making, and general manufacturing purposes, the demand for Scotland has tended to steady prices. But there is no difficulty in buying as low as 7s.; whilst 7s. 6d. at the pit mouth represents the full average figure obtainable for ordinary descriptions. Much the same may be said with regard to engine fuel, a good deal of which is also going away for Scotland, with prices at the pit mouth ranging from 3s. 9d. to 4s. 3d. per ton for common, 4s. 9d. to 5s. 3d. for medium sorts, and about 6s. for the best qualities. In the shipping trade, a fairly large business is being done; but not more than 8s. 9d. to 9s. is to be had for ordinary steam coal, and 5s. 6d. to 5s. 9d. for good qualities of slack, delivered at Mersey ports.

**Northern Coal Trade.**—There has been a stronger demand for coal; but there are now signs of a falling off in the extraordinary demand from Scotland; and this would unquestionably weaken the prices. At present, with the shipping season in full swing, and with both locomotive and gas coal going in fair quantities to Scotland, the output of the district is well taken up; and there is a fuller working of some of the Durham pits than is usual at this time of the year. But should Scotch orders cease, as seems probable soon, the time is coming when the gas coal requirements steadily grow, and this natural growth will compensate for the loss of what has been an abnormal demand. Best Northumbrian steam coals are quoted at 10s. 9d. per ton, f.o.b., though sales both above and below that price are taking place. Second-class steam coals are about 10s. per ton, and in a few cases a little lower price is taken; and steam smalls are about 4s. 9d. per ton—prices which are certainly above those usual at this season. Bunker coals continue abundant at 7s. per ton, f.o.b., for unscreened qualities. Gas coals maintain their value steadily at from 7s. to 8s. per ton, f.o.b., according to the quality, and to the position of the pits. It is expected that the contracts for the supply of the Stockton Corporation Gas-Works will be settled in a few days; and an increase in price on last year's rate is expected. Manufacturing coals are steady; stocks having been much reduced by the demand from the north. Coke is a little irregular in position; the exports being limited, though the local demand continues very full. The price of best Durham coke varies from 13s. 6d. to 14s. 6d. per ton, f.o.b.; and there are some signs of rather larger shipments for smelting purposes abroad. Gas coke still maintains its price; and though there is now an increase in the output, the deliveries to some of the cement and other large works are increasing, and the stocks are kept low.

**Scotch Coal Trade.**—Trade is as it was last week. There is still coal in Fifeshire for sale; but it is scarce, and fancy prices are being asked for it. Nearly all the coal on sale, however, is from England. The price for it has not advanced since last week. If anything, it has receded—due to the circumstance that there is more on offer than is being required; many manufacturers having rather closed their works than pay high prices. The shipments are getting less. For the week, they amounted to 7653 tons—a decrease as compared with the preceding week of 2346 tons, and as compared with the corresponding week of last year, of 171,212 tons. For the year to date, the total shipments have been 3,733,235 tons—a decrease upon the quantity in the same period of last year, of 667,230 tons.

**The Purchase of the St. Ives Gas-Works by the Corporation.**—At a special meeting of the St. Ives Town Council yesterday week, Mr. J. Daniels reported that the Committee recently appointed had purchased the local gas-works. For about £2000, they had secured the works, coal, bricks, and material on and off the grounds. This sum also included land at the back of the works held on a lease for 500 years; the fee of the ground; and all the mains and plant. They had secured a good bargain. By laying out another £2000 or £3000, the works could be made very efficient. Mr. Hain remarked that he thought the Council would be able to grant a very considerable reduction in the price of gas in the course of twelve months. Had it not been for their prompt and decisive step, the town would have been in darkness during the winter months. He moved that the action of the Committee be confirmed, and suggested that they remain in office for the next few months, as there was some important work to be done almost immediately. The motion was unanimously agreed to. It was also resolved to apply to the Local Government Board for a sum not exceeding £6000 for lighting purposes, and to borrow a sum not exceeding £4000 for water supply.

**The Purchase of the Barry and Cadoxton Gas and Water Works by the Local Board.**—According to a report submitted by the Directors at a meeting of the shareholders of the Barry and Cadoxton Gas and Water Company last Friday week, the purchase of the undertaking by the Local Board has not been completed, but interest has been accruing at the rate of 5 per cent. per annum on the purchase-money. The Directors have made application for the amount due in accordance with the special statute; and they are taking all necessary steps to protect the interests of the shareholders. Every care has been exercised in carrying on the undertaking for the Local Board; and the profits show an increase of £600 over those of the corresponding half of 1893. The Local Board have purchased nearly the whole of the debenture stock; and it is suggested that holders of this stock who have not accepted the terms offered had better do so. A statement was made at the meeting by Mr. H. P. Linton to the effect that the Local Board are preparing, by issuing a public loan, for raising the necessary funds to take over the works, and that the issue will be dealt with in a way satisfactory to all the parties concerned. The Board have agreed to a distribution of interest at the rate of 5½ per cent. on the capital of 1886, on the water stock of 1889, and a proportionate interest on the 1889 gas stock.

**The Newbury Corporation and the Gas Manager's "Extras."**—At the meeting of the Newbury Town Council last Tuesday, the question of the payment made by the Gas Committee to the Manager (Mr. R. M. Couper), for services in connection with the improvement of the works, was again under discussion. It may be remembered that at the meeting of the Council on the 17th ult. (see *ante*, p. 199), it was decided that Mr. Couper should be paid £80 for his "extras;" and that, as he had received from the Gas Committee, unauthorized by the Council, a cheque for £139, the amount of his account, the Town Clerk should write to him to refund the difference. Mr. Couper's reply to this request was now read. It contained a respectful, but firm, refusal to comply with the request, and an expression of regret that his proposal to have the matter submitted to arbitration was not entertained. He renewed his offer; but at the same time he distinctly stated that he did not admit holding any money that did not belong to him. A long and animated debate followed the reading of the letter; but it eventually narrowed down to a simple question put to the Town Clerk by Alderman Dolton, and repeated by Mr. Withers: "Are we in a position to make Mr. Couper return the money?" The Town Clerk said it would be exceedingly difficult, if not impossible, to get the money back; as, if they attempted it, Mr. Couper might set up the question of fairness or unfairness. Then came a dark threat from a councillor that he would give notice of a resolution calling upon the Manager to resign his position; and it received promises of support from several of his colleagues. Subsequently, however, a suggestion was made that the matter should be allowed to drop. This was supported by the Mayor (Mr. J. Elliott); and the Council proceeded to the next business.

**Sales of Shares.**—Last Thursday week, Messrs. Love and Cooper sold, at Southsea, a number of shares in the *Portsmouth Water Company* as follows: 1883 issue shares, at from £8 5s. to £8 7s. 6d.; 1879 issue, at £9 17s. 6d.; 1868 issue, at £13 10s.; and shares of the original issue, at £28. Some "B" shares in the *Portsea Island Gas Company* realized £113 10s.——At Huntingdon last Tuesday, nine £10 fully-paid-up shares in the *Huntingdon and Godmanchester Gas Company* were put up to public competition, and realized £18 5s. each.

**Extension of the Electric Lighting Area at Portsmouth.**—The Portsmouth Town Council have agreed to apply to the Local Government Board for sanction to the borrowing of £1265, for the purpose of extending their electricity distribution system. On the 1st inst., there were, exclusive of the public lighting, 3517 16-candle power lamps connected with the wires; but, according to Alderman Ellis, 6000 or 7000 lamps will have to be fixed before they will be able to run the installation and pay the attendant expenses "without coming on the rates for a farthing."

**The Accrington Gas and Water Company and their Surplus Profit.**—As intimated in the JOURNAL last week, the undertakings of the Accrington Gas and Water Company are about to be taken over by the Local Authorities. After the payment of the maximum dividends, there was left three sums of £8087, £809, and £5000 to be disposed of. The shareholders have now decided that the first two amounts shall be divided between the holders of "A" and "B" stock; and a Committee of eight have been appointed to confer with the Directors as to how the £5000 shall be dealt with.

**An Unjust Weighing-Machine.**—At the Kirkham Police Court last Wednesday, a case was heard in which the Kirkham Gas Company were summoned for having in use "an unjust weighing-machine, and also a false weighing-machine." A police officer stated that he inspected the two machines on the 8th of August. The large one, used by the public, was 34 lbs. in the ton against the Company. From the balance-sheet, it appeared that between 600 and 700 loads of coke were weighed upon it every year, and the public were thus innocently defrauding each other. A smaller machine was against the purchaser to the extent of 4 lbs. in 14 lbs., 6 lbs. in 28 lbs., 7 lbs. in 56 lbs., and 8 lbs. in 112 lbs. The Secretary of the Company admitted that the machine was wrong. The Bench said the evidence showed great negligence, as the machine ought to be balanced and kept correct so as to protect the public. The Company were fined 20s. and costs.

**New Joint-Stock Companies.**—The following joint-stock undertakings have just been projected: Petroleum Products Syndicate, Limited, with a capital of £10,000, in £1 shares, to enter into an agreement with Messrs. C. Weygang and W. M. Gillam to acquire any inventions, secret processes, patents, patent rights, &c., relating to petroleum and other oils. Syndicat de Traction par le Gaz, Limited, with a capital of £20,000, in £40 shares, to acquire certain inventions for France and the French colonies and dependencies, relating in any way to the traction or propulsion of vehicles by means of gas, or to the construction, maintenance, improvement, and working of cars, vans, carriages, locomotives, &c.; to enter into agreements with the Gas Traction Company, Limited, and with Messrs. T. H. Pearson and W. W. Rutherford; and generally to carry on business as mechanical and general engineers. Atmospheric Gas Syndicate, Limited, with a capital of £6000, in £1 shares, to enter into an agreement with the London Traders' Trust Corporation, Limited, and to acquire, develop, and turn to account certain patents, particulars of which are not given.

**Tottenham and Edmonton Gas Company.**—The ordinary meeting of this Company was held last Saturday; and a report of the proceedings will be published in our next issue. In the meantime, it may be stated that in the half year ending June 30, there was a growth in the consumption of gas of 9,505,200 cubic feet, or 6·32 per cent.; and an increase in the number of meters of 655, of which 600 were on the prepayment system. Cooking stoves on rental showed an increase of 172. Residuals likewise presented a marked improvement. The financial result of the operations was a balance available for dividend of £7321, of which £67 was brought forward; and after paying the dividends declared, at the rates per annum of 11½ and 8½ per cent., there will remain £479 to be carried to the accounts of the current half year. The sale of gas in the six months produced £24,562; meter and stove rental, £749; residuals, £6727; and three small items made a total income of £32,097. The principal charges on revenue account were: Manufacture of gas, £18,221; distribution, £1519; public lamps, £678; rents, rates, and taxes, £1636; and management, £1667. Other small amounts brought up the expenditure to £24,046—thus leaving a balance of profit of £8051.

**Extensions at the Widnes Gas-Works.**—At the last meeting of the Widnes Town Council, the Gas and Water Committee recommended that certain extensions at the gas-works (which had been proposed by the Gas Engineer, Mr. Isaac Carr) should be carried out as occasion required, and that £11,502, the estimated cost, should be borrowed under the provisions of the Local Government Board's Provisional Orders Confirmation (Aspull, &c.) Act, 1879. The Engineer had been instructed to proceed forthwith with the removal and the re-erection of the sulphate plant, at an estimated expenditure of £1500. Alderman Wareing, in presenting the minutes for confirmation, said the proposed extensions had been before the Council for eighteen months; and their necessity was well recognized. It was proposed to raise the present working capacity from 1 million to 1½ million cubic feet per diem. If they confirmed the minutes, it did not follow that the whole scheme would be carried out immediately; but the Committee desired to be in the position to spend from time to time as much as might be necessary. Replying to questions, Alderman Wareing explained that the diminished profit on the undertaking was partly due to the late coal strike, which involved an additional outlay of £1600 for coals; and the Engineer pointed out that the price of gas had been reduced from 2s. 9d., 3s., and 3s. 6d. to 1s. 8d. and 1s. 10d. per 1000 cubic feet. The motion was adopted. Last Wednesday, the members of the Corporation visited the gas-works; and Mr. Carr explained the extensions it is proposed to make. The new columnless gasholder at Ditton was also inspected.

**The New Water-Works for Colwyn and Conway.**—The scheme of water supply whereby the Colwyn Local Board district and the Conway Urban Sanitary district are to be supplied with water from Lake Cowlyd, at a cost of £30,000, is so far completed that on Monday last week the water was informally turned on as far as Conway is concerned. The scheme has been carried out from designs by Mr. T. B. Farrington, Borough Surveyor of Conway. The supply for Colwyn Bay, it is expected, will be furnished this week.

**Defrauding the Chester Gas Company.**—At the Chester City Police Court last Friday, William Bernhardt, a hairdresser and newsagent, who occupied two adjoining shops, was charged with having illegally connected an india-rubber pipe to the service-pipe supplying gas to one of them, by which means he was able to procure gas for use in the other without being registered by the meter. Defendant had been a customer of the Company since 1887. In that year he had a meter to each shop. He afterwards arranged for the whole supply to pass through one meter; and during the past twelve months, the revenue derived from him by the Company had considerably diminished. Evidence was given as to the detection of the india-rubber connection; and defendant was fined 40s. and costs.

**Para Gas Company, Limited.**—The Directors of this Company have issued to the shareholders the statement of accounts for the six months ending March 31 last, together with the following information: "The increased cost of carbonizing material, caused by quarantine in Brazil, and by the late strike, has materially affected the profits of the Company; and the result for the half year is therefore not so satisfactory as that of the previous half year. In reply to an advertisement, a tender has been accepted for lighting the city by electricity; but the terms which have been published appear so onerous as to promise little profit in the undertaking. Meantime, at the request of the Government, the concession, under which this Company works, has been extended for a further period of twelve or fifteen months (at the option of the Government) from October, 1894, at which date the present extension would have expired." The revenue account shows that the total income was £14,543, and that, after meeting the expenses, a profit of £633 remains. The balance on the profit and loss account is £3484. The usual half-yearly dividend on the preference shares has been paid.

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 415.)

| Issue. | Share | When ex-Dividend. | Dividend or Div. & Bonus. | NAME. | Paid per Share | Closing Prices. | Rise or Fall in Wk. | Yield upon investment. |
|---|---|---|---|---|---|---|---|---|
| £ | | | p. c. | GAS COMPANIES. | | | | £ s. d. |
| 390,000 | 10 | 12 Apl. | 10½ | Alliance & Dublin 10 p. c. | 10 | 18½–19½ | .. | 5 7 8 |
| 100,000 | 10 | ,, | 7½ | Do. 7 p. c. | 10 | 13–14 | .. | 5 7 2 |
| 300,000 | 100 | 2 July | 5 | Australian (Sydney) 5 % Deb. | 100 | 105–107 | .. | 4 13 4 |
| 100,000 | 20 | 14 June | 8 | Bahia, Limited | 20 | 9½–10½ | .. | 15 3 10 |
| 200,000 | 5 | 11 May | 6½ | Bombay, Limited | 5 | 5¾–6 | +⅛ | 5 8 4 |
| 40,000 | 5 | ,, | 6½ | Do. New | 4 | 4⅛–4¾ | +⅛ | 5 9 6 |
| 380,000 | Stck. | 15 Aug. | 11½ | Brentford Consolidated | 100 | 222–227* | .. | 5 1 4 |
| 180,000 | ,, | ,, | 8½ | Do. New | 100 | 172–177* | .. | 4 16 1 |
| 220,000 | Stck. | 15 Mar. | 11½ | Brighton & Hove Original | 100 | 210–215 | .. | 5 6 11 |
| 888,500 | Stck. | 28 Feb. | 5 | Bristol | 100 | 113–116 | .. | 4 6 2 |
| 320,000 | 20 | 29 Mar. | 11½ | British | 20 | 47⅛–48⅛ | .. | 4 12 9 |
| 50,000 | 10 | 28 Feb. | 11½ | Bromley, Ordinary 10 p. c. | 10 | 21⅛–22⅝ | .. | 5 2 2 |
| 51,510 | 10 | ,, | 8½ | Do. 7 p. c. | 10 | 16⅛–17⅝ | .. | 4 17 2 |
| 328,750 | 10 | 28 June | 2 | Buenos Ayres (New) Limited | 10 | 5¼–5⅜ | .. | 3 9 7 |
| 200,000 | 100 | 2 July | 6 | Do. 6 p. c. Deb. | 100 | 99–101 | .. | 5 18 10 |
| 150,000 | 20 | 12 July | 8 | Cagliari, Limited | 20 | 25¼–26¼ | .. | 6 0 8 |
| 550,000 | Stck. | 12 Apl. | 12½ | Commercial, Old Stock | 100 | 265–270 | .. | 4 12 7 |
| 165,000 | ,, | ,, | 9½ | Do. New do. | 100 | 195–200 | .. | 4 15 0 |
| 160,762 | ,, | 14 June | 4½ | Do. 4½ p. c. Deb. do. | 100 | 132–137 | .. | 3 5 8 |
| 800,000 | Stck. | 14 June | 13 | Continental Union Limited | 100 | 239–244 | .. | 5 6 7 |
| 200,000 | ,, | ,, | 10 | Do. 7 p. c. Pref | 100 | 210–215 | .. | 4 13 0 |
| 535,000 | Stck. | 28 Feb. | 5 | Crystal Palace Ord. 5 p.c. Stk. | 100 | 107–112 | .. | 4 9 2 |
| 486,090 | 10 | 27 July | 11 | European, Limited | 10 | 22½–23½ | –⅛ | 4 13 7 |
| 354,060 | 10 | ,, | 11 | Do. Partly paid | 7½ | 16–17 | .. | 4 17 1 |
| 5,646,590 | Stck. | 15 Aug. | 12 | Gaslight & Coke, A, Ordinary | 100 | 245–250* | .. | 4 16 0 |
| 100,000 | ,, | ,, | 4 | Do. B, 4 p. c. max. | 100 | 100–104* | .. | 3 16 11 |
| 665,000 | ,, | ,, | 10 | Do. C, D, & E, 10 p.c. Pf. | 100 | 271–270* | .. | 3 12 6 |
| 30,000 | ,, | ,, | 5 | Do. F, 5 p. c. Prf. | 100 | 130–135* | .. | 3 14 1 |
| 60,000 | ,, | ,, | 7½ | Do. G, 7½ p. c. do. | 100 | 192–197* | .. | 3 16 1 |
| 1,300,000 | ,, | ,, | 7 | Do. H, 7 p. c. max | 100 | 179–184* | +2 | 5 16 1 |
| 163,000 | ,, | ,, | 10 | Do. I, 10 p. c. Prf. | 100 | 270–275* | .. | 3 12 9 |
| 476,000 | ,, | ,, | 6 | Do. K, 6 p. c. Prf. | 100 | 165–170* | .. | 3 10 7 |
| 1,061,150 | ,, | 14 June | 4 | Do. 4 p. c. Deb. Stk. | 100 | 127–130 | .. | 3 1 6 |
| 294,850 | ,, | ,, | 4½ | Do. 4½ p. c. do. | 100 | 132–137 | .. | 3 5 8 |
| 908,000 | ,, | ,, | 6 | Do. 6 p. c. do | 100 | 175–180 | .. | 3 6 8 |
| 3,800,000 | Stck. | 11 May | 12 | Imperial Continental | 100 | 225–230 | .. | 5 4 4 |
| 75,000 | 5 | 14 June | 6 | Malta & Mediterranean, Ltd. | 5 | 4½–5¼ | .. | 5 14 3 |
| 560,000 | 100 | 2 Apl. | 5 | Met. of Melbourne, 5 p. c. Deb. | 100 | 109–111 | .. | 4 10 1 |
| 541,920 | 20 | 14 June | 5 | Monte Video, Limited | 20 | 14½–15½ | .. | 6 9 0 |
| 150,000 | 5 | 30 May | 8 | Oriental, Limited | 5 | 6¾–7 | +⅛ | 5 14 3 |
| 60,000 | 5 | 29 Mar. | 7 | Ottoman, Limited | 5 | 3¾–4¼ | .. | 7 7 4 |
| 166,870 | 10 | 31 Jan. | 2 | Pará Limited | 10 | 1⅛–1⅜ | –⅛ | 11 8 6 |
| 420,000 | 100 | 2 May | 6 | People's Gas of Chicago— 1st Mtg. Bds. | 100 | 102–107 | .. | 5 12 1 |
| 500,000 | 100 | 1 June | 6 | 2nd Do. | 100 | 95–100 | .. | 6 0 0 |
| 150,000 | 10 | 26 Apl. | 6 | San Paulo, Limited | 10 | 9–10 | .. | 6 0 0 |
| 500,000 | Stck. | 28 Feb. | 15½ | South Metropolitan, A Stock | 100 | 325–330 | .. | 4 14 0 |
| 1,350,000 | ,, | ,, | 12 | Do. B do. | 100 | 277–282 | +2 | 4 5 1 |
| 260,000 | ,, | ,, | 13 | Do. C do. | 100 | 289–294 | +2 | 4 8 5 |
| 750,000 | ,, | 12 July | 5 | Do. 5 p. c. Deb. Stk. | 100 | 155–160 | .. | 3 2 6 |
| 60,000 | Stck. | 28 Feb. | 11½ | Tottenham & Edm'nton, "A" | 100 | 215–220 | .. | 5 4 7 |
| | | | | WATER COMPANIES. | | | | |
| 746,011 | Stck. | 28 June | 10 | Chelsea, Ordinary | 100 | 285–290 | +2 | 3 9 0 |
| 1,720,252 | Stck. | 12 Apl. | 8 | East London, Ordinary | 100 | 228–233 | .. | 3 8 9 |
| 544,440 | ,, | 28 June | 4½ | Do. 4½ p. c. Deb. Stk. | 100 | 147–152 | .. | 2 19 2 |
| 700,000 | 50 | 14 June | 8½ | Grand Junction | 50 | 119–123 | .. | 3 9 1 |
| 708,000 | Stck. | 15 Aug. | 12 | Kent | 100 | 300–305* | .. | 3 18 8 |
| 1,043,800 | 100 | 28 June | 9½ | Lambeth, 10 p. c. max. | 100 | 258–263 | .. | 3 12 3 |
| 406,200 | 100 | ,, | 7½ | Do. 7½ p. c. max. | 100 | 207–210 | .. | 3 11 5 |
| 330,000 | Stck. | 29 Mar. | 4 | Do. 4 p. c. Deb. Stk. | 100 | 132–135 | .. | 2 19 3 |
| 500,000 | 100 | 15 Aug. | 12½ | New River, New Shares | 100 | 379–384* | +2 | 3 3 2 |
| 1,000,000 | Stck. | 27 July | 4 | Do. 4 p. c. Deb. Stk | 100 | 134–137 | .. | 2 18 4 |
| 902,300 | Stck. | 14 June | 6 | S'thwk & V'xhall, 10 p. c. max. | 100 | 168–173 | .. | 3 9 4 |
| 126,500 | 100 | ,, | 6 | Do. D 7½ p. c. do. | 100 | 149–152 | .. | 3 19 0 |
| 1,155,066 | Stck. | 14 June | 10 | West Middlesex | 100 | 273–278 | .. | 3 12 0 |

*Ex div.

**Issue of New Capital by the Paignton Gas Company.**—The Paignton Gas Company have decided to increase their capital by the issue of 300 4 per cent. preference shares of £10 each; and they have also considered the question of issuing £3000 of debenture stock.

**Lostwithiel Corporation Water Supply.**—The Lostwithiel Corporation have accepted a tender submitted by Messrs. Oliver and Minear, of St. Blazey, for the construction of works of water supply. The amount of the tender is £1996, which is very close to the estimate —£2059—of the Engineer (Mr. Jenkin).

**The Water Rights of the Halifax Corporation.**—In the Chancery Division of the High Court of Justice, on the 9th inst., the case of *The Halifax Corporation v. The Morley Corporation* was mentioned to Mr. Justice Kekewich. It was an action heard on the 1st of May last (see JOURNAL for May 8, p. 855) to restrain the Morley Corporation from supplying water to the Great Northern Railway Company within the district of the Halifax Corporation. Mr. Cozens-Hardy, Q.C., representing the Morley Corporation, pointed out that his Lordship had restrained the defendants, but suspended execution of the order pending negotiations for an arrangement which was thought possible between the parties. These *pourparlers* had, however, fallen through; and he now asked for a further suspension, pending an appeal by the Corporation to the House of Lords. Mr. Warmington, Q.C., for the plaintiff Corporation, resisted the application as being, in effect, a renewal of a request which his Lordship refused at the hearing of the case, when six months' delay was asked; but he reduced it practically to three months. His Lordship, thinking no mischief could follow an extension of the suspension, granted the application, on the undertaking already given with respect to damages being continued.

**Morley Water Supply.**—The new water-works at Morley, which have been constructed at a cost of £100,000, were opened last Saturday afternoon. Hitherto Morley, which is now a corporate town, has derived its supply of water from Leeds. After the opening ceremony, the Corporation and the public bodies partook of luncheon; and sports followed.

**Rewards to Employees at the Nantes Gas-Works.**—The last number of the *Journal des Usines à Gaz* contains the names of 13 employees of the European Gas Company at Nantes who have been rewarded, by the Minister of Commerce and Industrie, on the recommendation of the Manager of the station (M. Gaston Gautier), for long and faithful service. The periods range from 30 to 37 years.

**The Manufacture of Water Gas at the Belfast Gas-Works.**—The Gas Committee of the Belfast Corporation last Thursday considered the question of extending the manufacturing plant at the works. They resolved to recommend the Council to erect water-gas plant, instead of coal retorts, at a cost of about £18,500. The expenditure will ensure a daily production of 900,000 cubic feet, and will cost a great deal less in labour and fuel than for ordinary coal gas.

**Outside Local Authorities and the London Water Question.**—At their meeting last Wednesday, the Kent County Council received and adopted a report from their Parliamentary Committee, stating that two delegates had attended the conference convened by the London County Council on the subject of the proposed acquisition by the Council of the undertakings of the Water Companies. All the authorities interested were represented at the conference, and they were unanimously of opinion that the proposals of the Council could not be acceded to, and that their Bills must be opposed.


# GWYNNE & BEALE'S
## PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

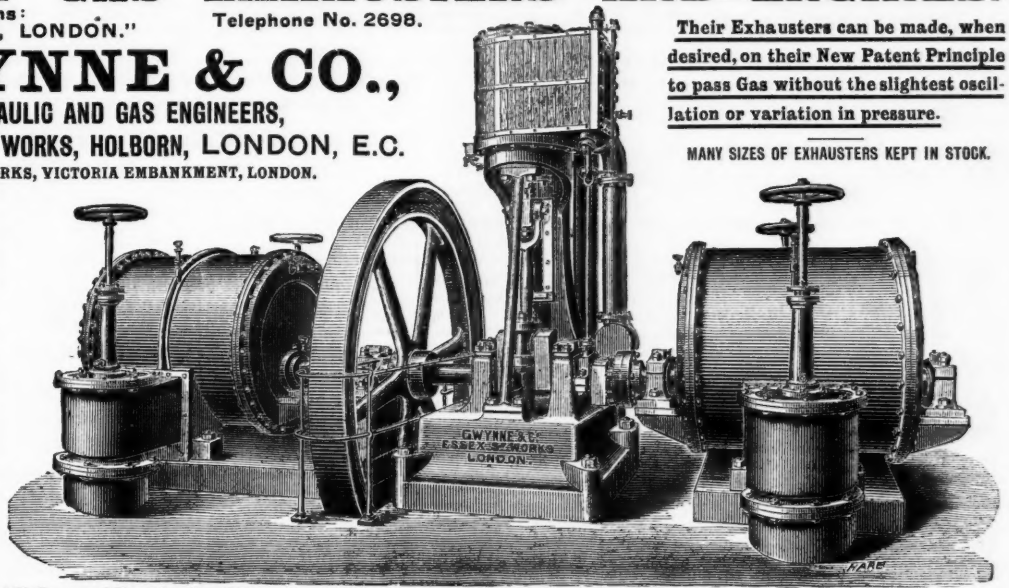
# GWYNNE & CO.,
## HYDRAULIC AND GAS ENGINEERS,
## BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

**They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.**

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM, PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

**Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.**




**Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.**

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

**Catalogues and Testimonials sent on application.**

OXIDE OF IRON.

**O'NEILL'S Oxide has a larger annual** sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

**ANDREW STEPHENSON, Agent. All** communications *re* OXIDE to be addressed to PALMERSTON BUILDINGS, E.C.

**WINKELMANN'S "VOLCANIC"** CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 200 British Gas-Works. [See Advt., p. 355.]
ANDREW STEPHENSON, 182, Gresham House, Old Broad Street, LONDON, E.C. Telegrams: "Volcanism, London."

**AMMONIACAL LIQUOR Wanted.**
BROTHERTON AND CO., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

**GAS TAR Wanted.**
BROTHERTON AND CO., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

**SPENT OXIDE Wanted.**
BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

**BROTHERTON & CO.**
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

**JAMES LAWRIE & Co. supply Best** SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGHIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

**W. C. HOLMES & CO., Huddersfield;** AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. II., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

**J. & J. BRADDOCK, Globe Meter Works,** Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
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SPECIAL PAINT FOR GAS-WORKS.

**JOHN E. WILLIAMS AND CO.,**
VICTORIA PAINT WORKS, MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.
GAS PLANT CEMENT
FOR ALL LEAKAGES.

SULPHURIC ACID.

**JOHN NICHOLSON & SONS, Chemical** Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

**BALE & CO.'S Oxide of uniform quality**
Sample and Price on application.
OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

**FINEST Quality of Natural Bog Ore.**
Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

**PORTER & CO., Gowts Bridge Works,** LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and adroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."

PATENTS FOR INVENTIONS.

**J. C. CHAPMAN, M.I.M.E. and Fel.** Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

REDHILL GAS-WORKS ASSESSMENT APPEAL

**THE Report of the proceedings at the** hearing of the APPEAL of the REDHILL GAS COMPANY against the RATING OF THEIR PROPERTY in Reigate and Nutfield which was published in the JOURNAL has been reprinted (by desire) in Pamphlet form; and copies can be obtained, on application to the PUBLISHER, *price 4d. each.*

**NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.**

**Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.**

GOLD MEDAL, 1892.

**TUBES and Fittings for Gas, Steam, and** Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

CHARTERING, FORWARDING, AND INSURANCE.

**ROBERT BRUCE FITZMAURICE, 29,** Great St. Helens, London, Shipping Agent to several Gas Companies and Plant Manufacturers, would be glad to UNDERTAKE LARGE or SMALL SHIPMENTS to any Port.

**HUTCHINSON BROTHERS,** Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See last week, p. 398.)
Telegrams: "HUTCHINSON BROS., BARNSLEY."

**ALWAYS a Buyer of Spent Oxide, Tar,** and AMMONIACAL LIQUOR.
Apply to J. HARDMAN, Milton, STAFFORDSHIRE.

**WANTED, by a single Man (aged 28),** a Situation on Gas-Works as STOKER or HANDY MAN. Six years' experience. Good references.
Apply to H. BARNES, Penn, near Amersham, BUCKS.

**WANTED, a Situation as Main and** SERVICE LAYER, METER FIXER, INDICE READER, STOVE FIXER, &c. Total abstainer.
Address, BAKER, 81, Willington Road, FOREST GATE, E.

**WANTED, a Situation, by a Manager's** Son, as WORKING MANAGER. Ten years' experience in all routine. First-class Testimonials.
Address No. 2423, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, by an Experienced Stoker,** CHARGE OF SMALL WORKS or otherwise. Good Carbonizer and Main and Service Layer. Can take Meters. Good references can be given.
Apply to Mr. S. DAWES, Manager, Gas-Works, CLEVEDON.

**WANTED, a Situation as Working** MANAGER. Good references. Holds Patent Right No. 14,490 for Mixture of Petroleum Oil and Coal Gas. No Royalty to pay. Twenty years' experience in Coal Gas, and eight years' experimenting in Oil Gas.
Apply, by letter, to No. 2421, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**ADVERTISER desires Engagement** either as SECRETARY, ACCOUNTANT, or ASSISTANT MANAGER. Twelve years' experience in Gas-Works Management and Accounts, also Thirteen years' in Municipal Accountantcy. First-class testimonials.
Address No. 2416, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, a Representative to in-** troduce new Patented Machinery into Engineering, Gas, and other Works. Need not interfere with existing engagements.
Experienced Travellers only need apply, by letter, to No. 2422, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, at once, an Active Man as** STOKER. Must have had some experience with Engine and Exhauster, and must be a good Carbonizer. Copies of references only to be sent (which will not be returned). Wages 25s. per week.
Apply, stating age, &c., to the MANAGER, Gas-Works, TREHARRIS.

**WANTED, a thoroughly competent** MANAGER for the Paignton Gas-Works. Duties: To take charge of the Manufacture and Distribution; to take Meters; and to generally Superintend the Outside Work in connection with the Gas-Works. House and Coal not provided.
Applications, stating age and salary required, accompanied by two recent testimonials (copies), to be sent to me on or before Saturday, the 1st of September.
F. W. PUDDICOMBE,
Secretary.
Gas Company, Paignton.

**WANTED, a second-hand Station Meter** passing 2400 to 3000 cubic feet per hour.
Send particulars to the SECRETARY, Gas Company, STORNOWAY.

CYANIDES.

**WANTED, Particulars of manufacture** from Gas Liquor and Spent Oxide. Communications treated confidential.
Mr. BROTHERTON, Commercial Buildings, LEEDS.

**WANTED, Two second-hand Station** METERS, to pass from 2000 to 4000 cubic feet per hour (3 or 4 inch Connections). Must be in good condition.
Prices and Particulars to J. S. CRANMER, Gas-Works, STRATFORD-UPON-AVON.

HYDRATED OXIDE OF IRON.

**PREPARED from pure Iron**
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

**SADLER AND CO., LIMITED,** MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

**FOR SALE—Four Purifiers, 6 feet square** each, two GIRDERS, with COLUMNS for carrying Lifting Apparatus, also DRY CENTRE-VALVE and CONNECTIONS, complete, to be sold cheap.
Apply to E. P., 22, Alwyne Road, Canonbury, LONDON, N.

BOROUGH OF WIDNES.

**THE Corporation invite Tenders for the** purchase of from 400 to 500 tons of GAS TAR from their Gas-Works for the Twelve Months ending the 30th of September, 1894.
Forms of Tender and Conditions of Contract may be obtained from Mr. Isaac Carr, Assoc.M.Inst.C.E., Gas-Works, Widnes.
Tenders, endorsed "Tar," to be delivered to the undersigned not later than the 3rd prox.
The highest or any tender not necessarily accepted.
H. S. OPPENHEIM,
Town Clerk.
Town Hall, Widnes,
Aug. 18, 1894.

RADCLIFFE AND PILKINGTON GAS COMPANY.

TO TAR DISTILLERS.

**THE Directors of this Company invite** TENDERS for the purchase of 700 tons of the surplus TAR now in stock, and to be produced at their Works in Radcliffe during the ensuing Ten Months.
Particulars may be obtained from the undersigned, to whom endorsed Tenders must be delivered not later than Thursday, the 6th of September.
JAMES BRADDOCK,
Manager and Secretary.
Gas-Works, Radcliffe,
Aug. 22, 1894.

TAR AND LIQUOR.

**THE Eccleshill and Bolton Gas Company** invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR to be produced at their Works, together or separately, for Twelve Months, from the 1st of September next. Can be delivered in Contractors' Tanks at the Station (G.N.R.).
Coal carbonized per annum, about 1800 tons.
Tenders, sealed and endorsed, must reach me not later than Monday, the 3rd of September.
J. MELLOR,
Secretary.
Eccleshill, Bradford,
Aug. 25, 1894.

BANDON TOWN COMMISSIONERS (CO. CORK).

GAS COAL.

**TENDERS are invited for the supply of** 500 tons of best, double screened GAS COAL, to be delivered Free at Albert Quay, Cork, or Courtmacsherry Pier, at per ton, as follows: 250 tons in the first week of October, 1894; the remainder in the first week of February, 1895.
The name and quality of the Coal to be specified in the tender.
Tenders, endorsed "Tender for Gas Coal," to be forwarded to the Bandon Town Commissioners not later than the 31st inst. (noon).
The Commissioners do not bind themselves to accept the lowest or any tender.
By order,
JOHN M'DONNELL,
Town Clerk.
Board-Room, Gas-Works, Bandon,
Aug. 10, 1894.

OTTOMAN GAS COMPANY, LIMITED.

**NOTICE is Hereby Given, that the** ORDINARY MEETING of the Shareholders in the above Company will be held at the Offices of the Company, 9, Queen Street Place, Cannon Street, E.C., on Tuesday, Sept. 4, at One o'clock, for the purpose of receiving a Report and Statement of Accounts from the Directors for the Half Year ending June 30, 1894.
The Transfer Books will be closed from Aug. 28 to Sept. 4, both days inclusive.
By order,
ARTHUR J. KING,
Secretary.
9, Queen Street Place,
Cannon Street, E.C., Aug. 16, 1894.

STRATFORD-UPON-AVON CORPORATION GAS DEPARTMENT.

**THE Gas Committee invite Tenders for** the GAS COAL they require during the ensuing Twelve Months.
Forms of Tender and all other Particulars upon application to
J. S. CRANMER,
Secretary and Manager.
August, 1894.

IMPORTANT SALE OF GAS SHARES.

**TO BE SOLD, by Auction, in the Long** Room of the Queen's Hotel, Fawcett Street, Sunderland, on Thursday, Sept. 6, 1894, at Half-Past Twelve for Half-Past One o'clock in the Afternoon—Mr. ARTHUR TREVOR CROW, Auctioneer—
1000 SHARES OF £5 EACH,
Maximum Dividend 8½ Per Cent.; being part of the Additional Capital authorized to be issued by the Sunderland Gas Act, 1857.
The above Shares will be entitled to Dividend from the 1st day of July last, and be registered in the name of the purchaser without charge.
A deposit of 10 per cent. will be required at the time of sale; the remainder to be paid on or before Oct. 1.
By order of the Directors,
J. H. COX,
Secretary and Manager.

IPSWICH GASLIGHT COMPANY.

ISSUE OF £4000 NEW ORDINARY "C" STOCK.
The Standard Rate of Dividend on this Stock is 7 per cent. per annum. The Dividend paid the last Four Years has been 8½ per cent. (17s. per £10) per annum.

**GARROD, TURNER, and SON will Sell** BY AUCTION, at the Gas Company's Offices, Carr Street, Ipswich, on Thursday, the 13th of September, 1894, at Seven o'clock p.m. precisely, this first-class LOCAL STOCK, in Lots of £10 and upwards; half the nominal amount of Stock comprised in a lot and the whole of the Premium to be paid up on the 1st of October, 1894, and the balance on the 1st of July, 1895.
Particulars may be had at the Offices of the Company; of the Solicitors, Messrs. NOTCUTT AND SON, 9, Museum Street; and of the AUCTIONEERS, 1, Old Butter Market, IPSWICH.

*Fcap. 4to, Cloth, price 7s. 6d., post free.*

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MICHAEL AND WILL ON GAS AND WATER.
*On the 17th of September will be ready, in One Volume, Royal 8vo., 32s. cloth,*

**The Law of Gas, Water, & Electric Lighting.**
New Edition.
Re-written and brought down to date by
J. SHIRESS WILL, Q.C.
London: BUTTERWORTHS, 7, FLEET STREET. (Her Majesty's Law Publishers.)

**HEBBURN MAIN GAS COALS.**

Yield of Gas per ton . . . . . 10,500 cubic feet
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

**For prices, f.o.b. Ship or Delivered by Rail, apply to**
**THE WALLSEND & HEBBURN COAL COMPANY, LTD.**
B Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

**T. B. KITTEL, SHEFFIELD.**
CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL
**ENGLISH & SCOTCH CANNELS.**
**REAL SILKSTONE GAS COAL**
ANALYSIS AND PRICES ON APPLICATION.
**T. B. KITTEL, SHEFFIELD.**

THE REMOVAL OF CARBON FROM GAS-RETORTS.

# GOOD & SPENCER'S

PATENTED METHOD OF

## REMOVING CARBON FROM RETORTS

Is a simple and inexpensive process, as it will clean a Single or Double Retort in from 15 to 30 minutes; thus saving time and loss of Gas through the Retorts being left out for Scurfing in the usual way.

For Royalties, &c., apply to J. E. & S. SPENCER, 14, Gt. St. Thomas Apostle, London, E.C.; and for Scurfing-Tool, price 36s. per dozen, to JOHN SPENCER, Globe Tube Works, Wednesbury.

## HARCOURT'S COLOUR TEST.

*For Carbon Bisulphide, Sulphuretted Hydrogen, and Carbonic Acid in Coal Gas.*

The Materials for the above Tests may be obtained from

Mr. S. E. MILLER, 115, Cowley Road, Oxford.

## HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

**600,000 Tons per Annum.**

Full particulars on application to

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-ON-TYNE.

## COKE BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT.)

*New Design, with two Cutting Rollers, making less Breeze than their old pattern.*

For Exhauster Advertisement, see last week.

GEORGE WALLER & CO.,

PARK STREET, SOUTHWARK, E.C.,

*And at STROUD, GLOUCESTERSHIRE.*

## UNEQUALLED.

Gas Companies are solicited to try Samples of the

## MIRFIELD

BLACK BED GAS COAL.

*Prices and Analysis on application.*

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

## NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

## BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

| | | |
|---|---|---|
| Yield of Gas per ton | 10,500 | Cubic Feet. |
| Illuminating Power | 16·9 | Candles. |
| Coke | 66·7 | Coke. |
| Sulphur | 0·86 | Sulphur. |
| Ash | 2·04 | Ash. |

**Boldon Gas Coals are supplied under contract to**

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Bombay Gas Company, Ipswich Gaslight Company, Devonport Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON,

FITTER.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

## CANNEL & COAL.

TYNE

## BOGHEAD CANNEL.

| | |
|---|---|
| Yield of Gas per ton | 13,155 cub. ft. |
| Illuminating Power | 38·22 candles. |
| Coke per ton | 1,301·88 lbs. |

## EAST PONTOP GAS COAL.

| | |
|---|---|
| Yield of Gas per ton | 10,500 cub. ft. |
| Illuminating Power | 16·3 candles. |
| Coke | 70 per cent. |

## SOUTH PELAW MAIN GAS COAL.

| | |
|---|---|
| Yield of Gas per ton | 10,500 cub. ft. |
| Illuminating Power | 16·3 candles. |
| Coke | 73·1 per cent. |

*For Prices and complete Analysis, apply to*

THOS. W. DANCE & SONS,

COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

E. FOSTER & CO.,

21, JOHN STREET, ADELPHI, LONDON, W.C.

## ROBERT MARSHALL,

CANNEL COAL MERCHANT,

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*Prices and Analysis of all the Scotch Cannels on Application.*

HUNTER'S

## OXIDE OF IRON.

JAMES HUNTER, LESSEE, MINER, AND SHIPPER OF

NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

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Telegrams: "HUNTER, PORT GLASGOW."

Established 1872.

## THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.

*Tudhoe Gas-Works,*

*Spennymoor,*

*8th June, 1893.*

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your THORNLEY GAS COAL exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.

Yield of Coke: 13¼ cwt.

Illuminating Power of Gas, average of a series of tests, 17 Sperm Candles.

The Coke was of excellent quality.

The following is a complete ultimate Analysis of the Coal.

| | Per Cent. |
|---|---|
| Carbon | 83·128 |
| Hydrogen | 5·116 |
| Oxygen | 7·401 |
| Nitrogen | 0·585 |
| Sulphur | 0·620 |
| Ash | 3·130 |
| Water | 0·020 |
| | 100·000 |

Analysis of the Coke.

| | |
|---|---|
| Carbon | 93·31 |
| Sulphur | 0·61 |
| Ash | 5·00 |
| Moisture | 1·08 |
| | 100·00 |

I am, Gentlemen,

Yours truly,

A. B. COWAN,

Manager.

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

**LONDONDERRY GAS COALS**

FROM THE

**MARQUIS OF LONDONDERRY'S COLLIERIES,**

**COUNTY OF DURHAM.**

Available output up to 5000 tons per day. Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

**S. J. DITCHFIELD,**

**SEAHAM HARBOUR, COUNTY OF DURHAM.**

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**CAST-IRON PIPES**

**FOR GAS AND WATER.**

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

**VALVES**

**FOR GAS, WATER, AND STEAM.**

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**WM. MACLEOD & CO.,**

56, ROBERTSON STREET, GLASGOW.

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**LOW MOOR BLACK BED**

**GAS COAL.**

YIELD OF GAS PER TON · 10,375 CUBIC FEET.
ILLUMINATING POWER · 17·50 SPERM CANDLES.
COKE · · · · · · · 75 PER CENT.

Prices, f.o.r. or f.o.b., on application to

**GEORGE & JOHN HAIGH,**

*RAVENS LODGE AND CONYERS' COLLIERIES,*

DEWSBURY.

A TRIAL IS RESPECTFULLY SOLICITED.

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*MANUFACTURERS OF*

**FILES OF BEST QUALITY**

FOR ENGINEERS.

**STEEL OF ALL DESCRIPTIONS.**

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS TOOLS GENERALLY.

*London Office:*

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**Brettell's Estate**

**FIRE-CLAY & BRICK WORKS,**

**STOURBRIDGE.**

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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**THE SILICA FIRE-BRICK COMPANY,**

**OUGHTIBRIDGE, near SHEFFIELD,**

MANUFACTURE

**SILICA BLOCKS, BRICKS, AND CEMENT**

OF SUPERIOR QUALITY

**FOR GAS-FURNACES.**

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY

Strongly recommended where EXCESSIVE HEATS have to be maintained.

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# R. DEMPSTER & SONS, LTD.

**Every Description of Gas Apparatus.**

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**INCLINED RETORTS,**

**FIRE BRICKS,**

**LUMPS, TILES,**

**BLOCKS, &c.**

Special Bricks for Intense Heats.

**GAS RETORTS.**

CASTINGS AND EVERY REQUISITE FOR **GAS-WORKS.**

**MOBBERLEY & PERRY,**

**Fire-Brick Works, STOURBRIDGE.**

☞ **Retort Setters sent to any part of the Kingdom.**

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# WILLEY & Co.,

Gas Engineering Works, Commercial Road, Exeter,

MANUFACTURERS OF EVERY DESCRIPTION OF

# GAS APPARATUS.

**GASHOLDERS,** Telescope and Single Lift, any size. Some of the largest in the Kingdom, erected by this Firm, are giving the highest satisfaction.

**PLANS and SPECIFICATIONS** furnished for **Extension** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

**PURIFIERS, CONDENSERS, WASHERS, ENGINES** and **EXHAUSTERS, STATION METERS,** and **GOVERNORS,** manufactured and erected.

Makers, by permission of that eminent authority **MR. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

**WET AND DRY METERS,**

which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

***Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.***

FOR **TUBES AND FITTINGS** APPLY TO

**JOHN BROTHERTON, LTD.,** IMPERIAL TUBE WORKS, **WOLVERHAMPTON.**

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**JOHN BROWN & CO., LTD., SHEFFIELD,**

Proprietors of

ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

**ALDWARKE MAIN GAS COAL**

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
*Telegrams: "ATLAS SHEFFIELD."*

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**CLAYTON SON & CO., LTD.,**

MAKERS OF **LEEDS**

LARGEST GASHOLDER IN **WORLD**

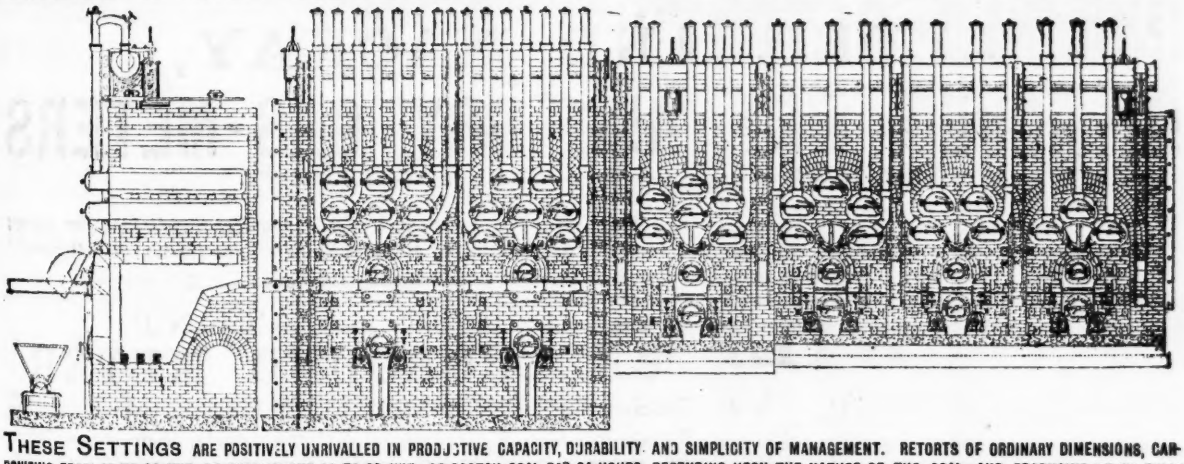
ALSO THE LARGEST METAL TANK THE

See Advertisement last week, also next week

MAKERS OF RETORT-LIDS OF ALL FORMS & SHAPES BY SPECIAL HYDRAULIC MACHINERY

---

**HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.**



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS, CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13 000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS, AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Specifications are furnished for the complete erection of Ovens, with or without Retort and Bench Mountings; or complete erection undertaken if required, and carried out by specially Trained Workmen.

**Further particulars may be obtained on application to the Patentee's Agents: C. M. HAMILTON, 5, Stuart Street, Shawlands, Glasgow; J. E. FISHER, Stourbridge; JOHN WALSH & SONS, Retort Builders, Halifax, Yorkshire; RICHARD TURNER, Retort Builder, Denton, Lancashire; and from the Principal Agent, R. F. HISLOP (son of Patentee), Gas-Works, Paisley, N.B.**

---

**HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE** is a *Sine quâ non*

THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

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**SPENT LIMES NO LONGER WASTE PRODUCTS**

Under G. R. HISLOP'S Patents, all Spent Limes are most effectually, economically, and continuously recovered at from one-third to one-half the cost o New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it.

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# WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

## MACHINE-MADE GAS-RETORTS.

# GAS AND WATER PIPES

AND

## CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

# CLAY CROSS COMPANY,

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| CXC | "JACKSON" | BECK & Co., |
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IMPROVED

## Sulphate of Ammonia Apparatus.

**The most successful and approved Apparatus known up to the present time.**

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**The Apparatus has been supplied to the following Firms—**

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ANIMAL CHARCOAL CO., Limited, SHADWELL.
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**And to the following Gas Companies and Corporations—**

| | | |
|---|---|---|
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| WIDNES. | BRIGHOUSE. | WHITEHAVEN. |
| HALIFAX. | MARKET HARBRO'. | CHESTER. |
| ALTRINCHAM. | PRESCOT. | SOUTH SHIELDS. |
| DENTON. | SOWERBY BRIDGE. | LEEK. |
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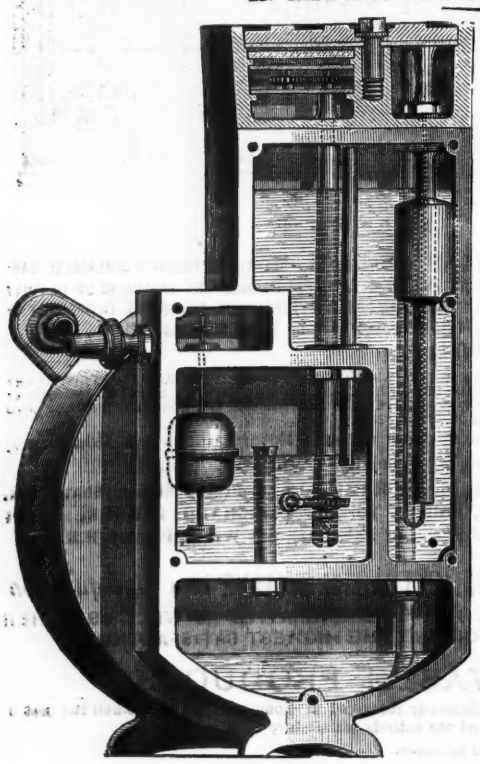
# IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.



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## GREEN'S PATENT
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Has been designed to obviate that which has hitherto prevented the general adoption of underground Meters—namely, their serious cost. No box is required, and the saving thus effected as compared with ordinary underground Meters, where either a box or meter-pillar is necessary, is fully one-half. The price of one for three lights is 28s., and the other sizes are correspondingly cheap. When fixed, the only part of the Meter exposed to view measures 6½ inches by 8½ inches. By the Indicator with which the Meter is fitted, the Inspector can at once discern whether water is required; but as the Meter is of the compensating description, water will probably need only be supplied ONCE A YEAR. It is advisable to fill the Meter with a non-freezing liquid, which does not injure the fittings; and this can be supplied at about 1s. 8d. per gallon.

*Prices and all Information on Application.*

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PURIFIERS with Planed Joints.

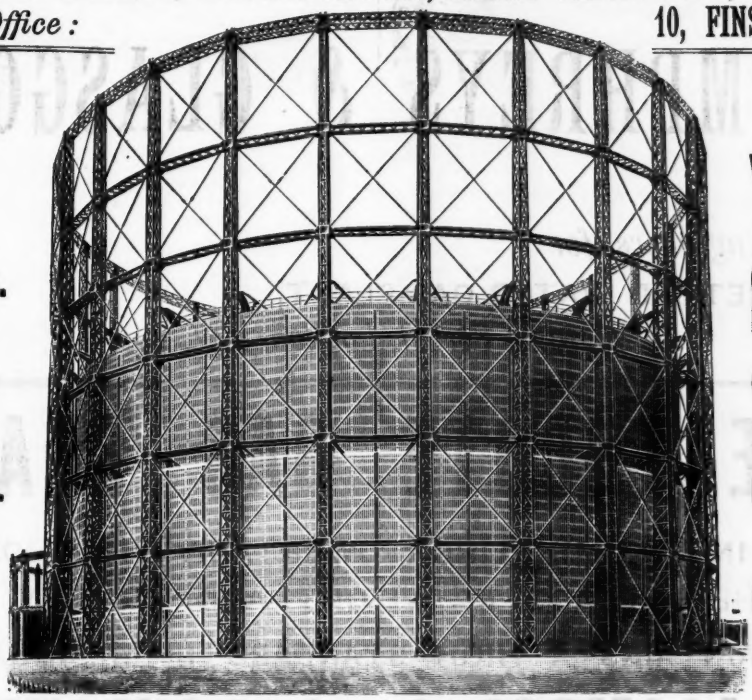
TOWER SCRUBBERS.

PURIFYING-MACHINES FOR AMMONIA.

CONDENSERS.

TAR PLANT.

SULPHATE OF AMMONIA PLANT.



GASHOLDERS.

WASHERS.

WASHER-SCRUBBERS.

CLAUS' SULPHUR-RECOVERY PLANT.

CENTRE & FOUR-WAY VALVES.

RETORT-MOUTHPIECES.

SLIDE-VALVES, TAR-BURNERS, SIEVES, &c., &c., &c.

The above is a view of the largest Gasholder (four-lift) of The Gaslight and Coke Company, Beckton, containing 8 million cubic feet, erected by us in 1892.

Sole Makers of **WECK'S** Patent CENTRE-VALVE, & **CRIPPS'** Patent HYDRAULIC MAIN VALVE.

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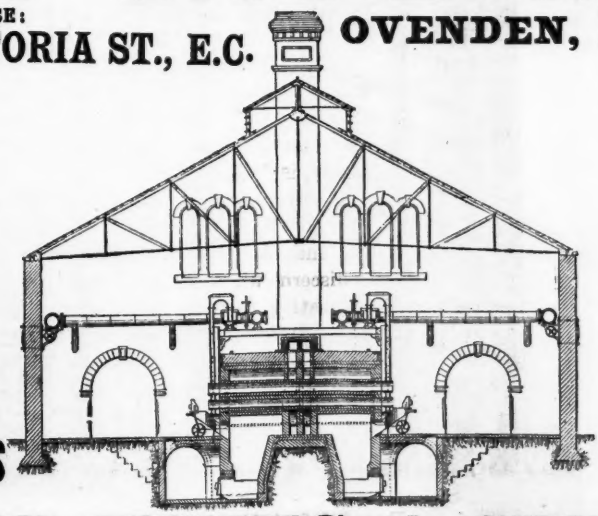
GAS ENGINEERS, CONTRACTORS, IRONFOUNDERS,

BUILDERS AND ERECTORS OF EVERY DESCRIPTION OF OVENS, BENCHES, KILNS, FURNACES, &c.



RETORT SETTERS, FURNACE BUILDERS ETC., ETC.

EGENERATOR AND GENERATOR FURNACES ON DRAKE'S, FRITH'S, SIEMENS'S, KLONNE'S, HASSE'S, VALON'S, SOMERVILLE'S, PONSARD'S and other Principles.

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RETORT SETTING IN ALL ITS PRINCIPLES AND BRANCHES. BENCHES FITTED UP COMPLETE.
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RICH IN ILLUMINATING POWER AND YIELD OF GAS.
ABOVE THE AVERAGE IN WEIGHT AND QUALITY OF COKE.
MAINTAINS A HIGH STANDARD IN RESIDUALS.

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NEARLY

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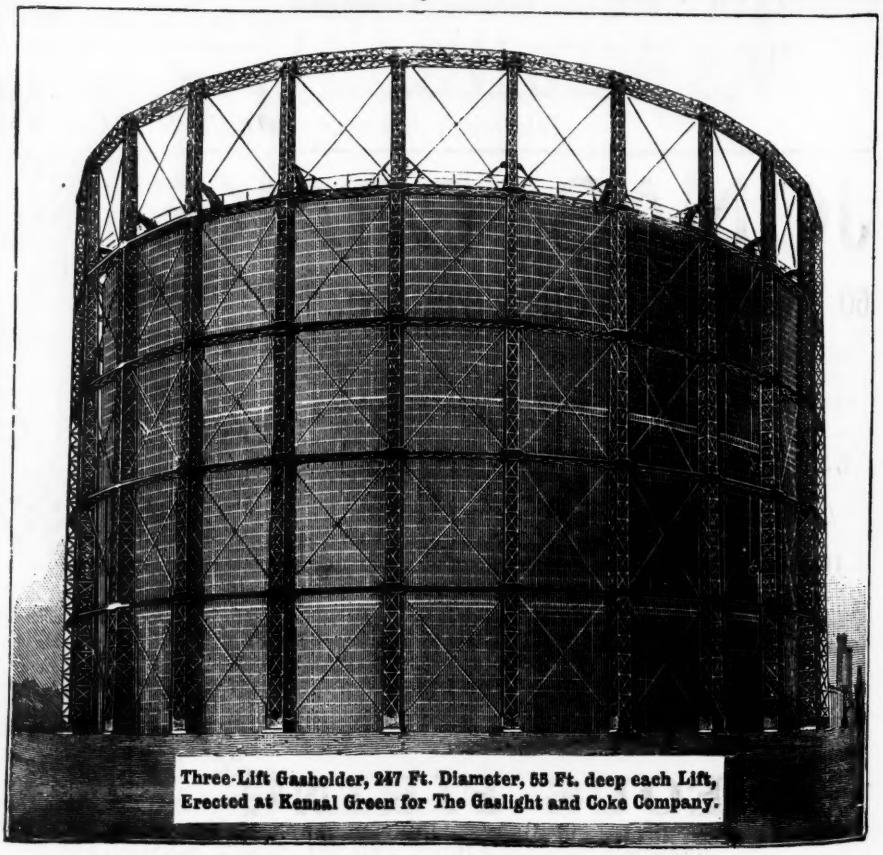
CAPACITY.



Three-Lift Gasholder, 247 Ft. Diameter, 55 Ft. deep each Lift, Erected at Kensal Green for The Gaslight and Coke Company.

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Mr. JOHN METHVEN, Gas Engineer of The Gaslight and Coke Company, Beckton, has tested this famous Cannel, and says:

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Contractors for the Erection of Gas-Works Complete, RETORT-SETTINGS, Furnace Building, the Erection of Retort-Benches, &c., &c.

N.B.—Special attention given to the Erection of Inclined Retort-Benches on the Generator and Regenerative Principles complete.

MAIN LAYING IN ALL ITS BRANCHES.

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Telegraphic Address: "GASRETORT, LONDON."

*Experienced Retort Setters and Main Layers sent to all Parts on the Shortest Notice.*

## ARROL-FOULIS
Patent Automatic Machinery
FOR
## DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,

GLASGOW.

See Illustrated Advertisement, p. II. Centre of JOURNAL for Aug. 14.

The Climax of Regenerative Gas Lighting!!

THE
## "VERTMARCHE"
A 280-CANDLE POWER
PLAIN IRON LAMP,
CLASS A— 55/-

LIGHT for LIGHT less than half the price of any other Regenerative Lamp.

Manufactured in England.

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PARTICULARS AND PRICES FREE. AGENTS WANTED.

## STOURBRIDGE
## RETORTS AND FIRE-BRICKS.
BEST QUALITY.

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[See Illustrated Advertisement, Aug. 7, p. 299.]

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Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

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Temple Buildings, 50, New Street, Birmingham.

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UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS.

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS.

AGENTS FOR

*ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.*

## J. & W. HORTON
ETNA WORKS,
SMETHWICK,
NEAR BIRMINGHAM
(Established 50 Years),

PATENTEES
AND
MANUFACTURERS
OF

IMPROVED GASHOLDERS AND BOILERS

and Manufacturers of every description of

Gas Apparatus,

Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

Drawings, Specifications, and Estimates supplied.

ESTABLISHED 1825.

# GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

## IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

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# THE WIGAN COAL & IRON CO., LIMTD.,

**Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.**

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# GASEOUS FIRING

FOR LARGE OR SMALL

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PLANS, SPECIFICATIONS, AND ESTIMATES SUBMITTED.

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ENGINEERS & CONTRACTORS

FOR THE ERECTION OF GAS AND WATER WORKS COMPLETE, AND FOR EXTENSIONS AND RENEWALS.

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**Sole Makers of Laycock and Clapham's**

# PATENT "ECLIPSE" WASHER-SCRUBBER.

Constructed on a **PRINCIPLE** which has **PROVED MOST EFFICIENT**, and **NOT REQUIRED IMPROVING**, giving the **LARGEST AMOUNT OF FRESHLY WETTED SURFACE** of any machine yet introduced.

**68 Machines, with a total Capacity of 76,100,000 Cubic Feet per day, have been supplied, or are in course of erection.**

Last year the Manchester Corporation put in an "ECLIPSE" WASHER-SCRUBBER to pass 3,000,000 Cubic Feet per day; and this year have ordered **TWO MORE, each to pass 4,000,000 Cubic Feet per day.**

OTHER LARGE REPEAT ORDERS HAVE ALSO BEEN RECEIVED.

**CLAPHAM'S IMPROVED VALVES, PURIFIERS, AND RETORT-FITTINGS; MAINS, AND GENERAL CAST AND WROUGHT IRONWORK.**

**CATALOGUES AND FULL PARTICULARS ON APPLICATION.**

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